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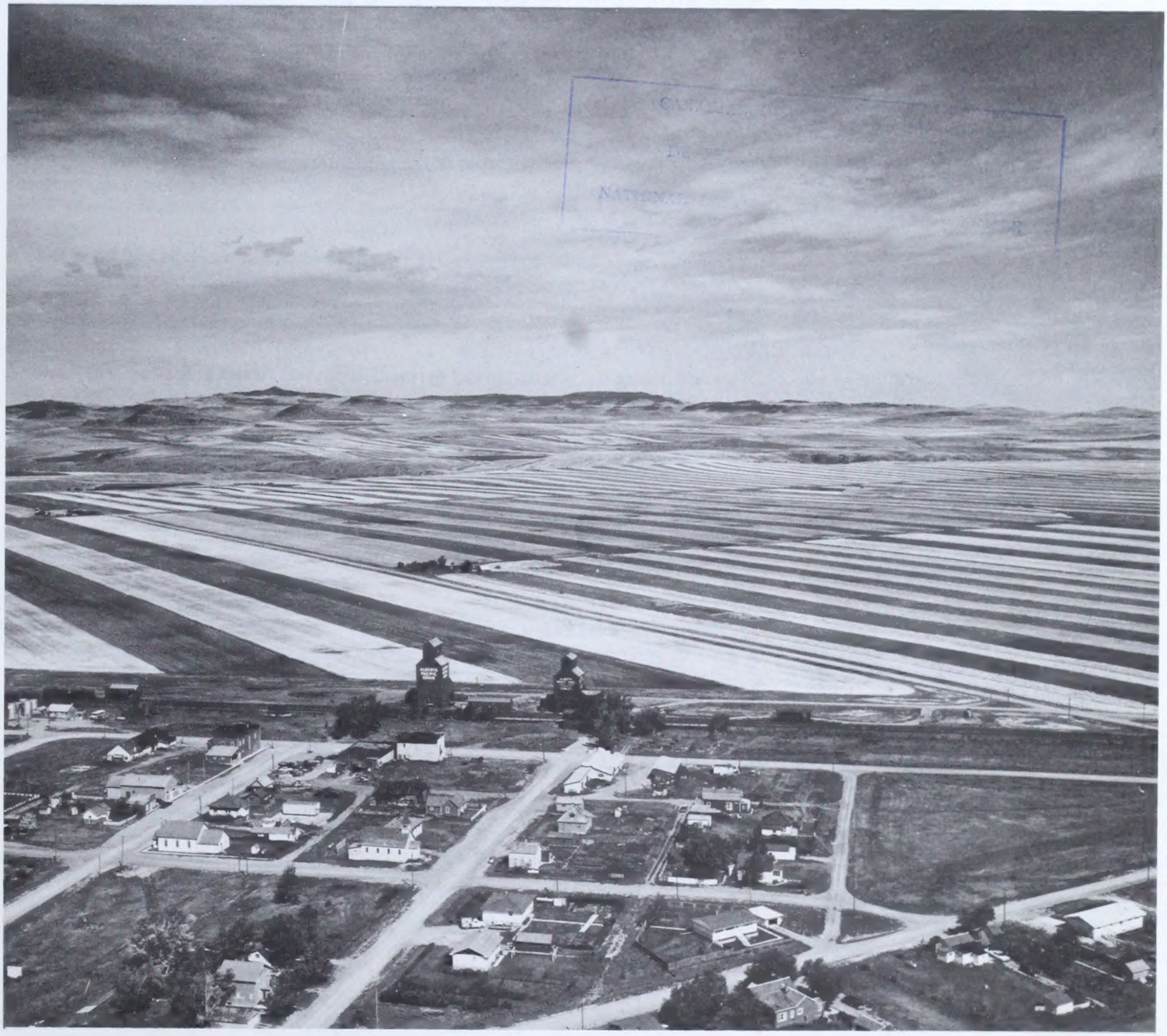

ALBERTA GOVERNMENT PHOTO

Agriculture and the Environment

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ENVIRONMENT VIEWS

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Alberta
ENVIRONMENT

Cover: Strip farming at Cowley, southern Alberta.

Introduction **Kathy Kennedy**

Agriculture and the Environment

Farming affects land, water and wildlife, but the environment--poor soils and climatic fluctuations--also works its will on agriculture.

Of all man's activities relating to his environment, agriculture is indisputably the most pervasive.

Driving past timeless pastoral scenes of grazing cattle and sheep, or through seemingly boundless expanses of wheat, it's hard to make any distinction between agriculture and the environment, between food-producing operations and the soil, water and wildlife systems they affect. Agriculture *is* the environment, for much of Alberta.

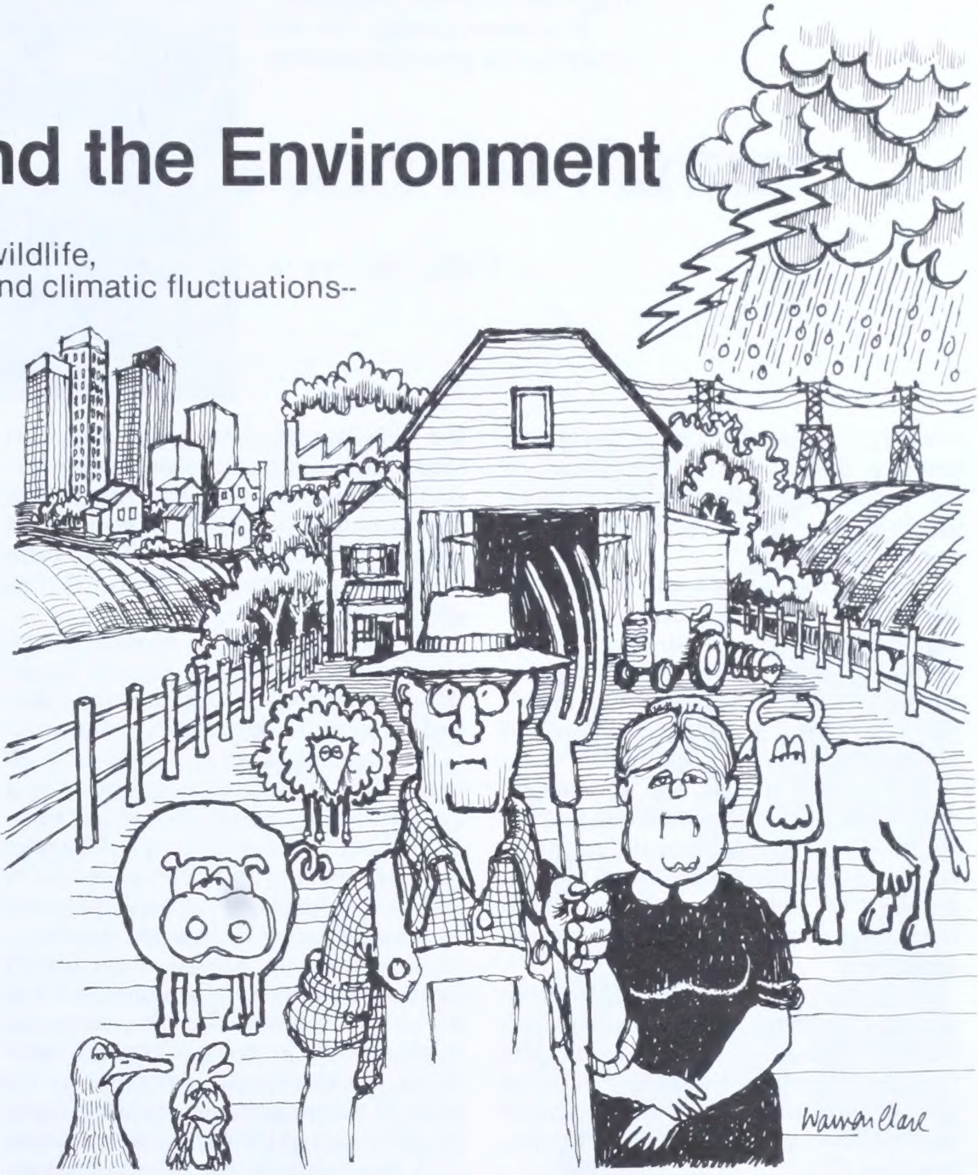
But not so long ago--less than three generations, and still in living memory--the land north of Edmonton was dark with spruce, the rolling hills of central Alberta were thick with poplar and willow, and the spacious southern prairie billowed with tall prairie grasses.

Because the land has only been extensively farmed for 50 or 60 years, some of the environmental repercussions, such as a decline in the organic content of the soil, are only now beginning to be felt.

And the interaction between farmers and the environment is not a simple situation of people imposing their will on the land. To the contrary, the environment is often a constraint on agricultural production. Poor soils and climatic fluctuations, as well as the encroachment of cities, towns and industries onto prime farmland, tax the ingenuity of farmers to produce the quality and quantity of food required by Albertans and the world.

Pollution is another two-way street, an environmental concern that agriculture both contributes to, and is affected by. While the soil erosion, animal wastes and chemical residues from improperly-managed farms can cause air and water pollution, industrial and urban pollution can also lower the yield-producing capability of farms.

But before looking at the questions of environmental constraints and pollution, let's consider some of the ways in which agriculture--the actual process of clearing and cultivating the earth--can affect the environment.



Roughly 50 million acres are used in livestock and crop production in Alberta today. The area is constantly increasing; last year 320,000 acres were newly cleared, up from 180,000 in 1973. Much of the new clearing is taking place in the Peace River country of the north.

Like most agricultural practices, clearing, or the removal of vegetative cover, carries with it potential for environmental degradation. Disturbing and laying bare the soil introduces the risk of wind and water erosion, which scatters, buries or washes away fertile topsoil.

Clearing isn't the only cause of soil erosion. Overgrazing can also undermine the vegetative cover and leave the soil vulnerable to erosive forces. Also, poor cultivation practices, such as growing the same crop year after year (monoculturing) in the same place with little or no fertilizer, can result in extensive erosion.

One of the most spectacular examples of this was the soil erosion resulting from extensive monoculturing of wheat in the United States and Canada in the 1930's. When organic matter is not continually replenished in the soil, the soil's structure deteriorates, its water balance is upset and the dry land is subject to wind erosion.

However, according to George Calver, associate director of Alberta Agriculture's engineering and rural services division, a "fair degree" of the province's farmers practice crop rotation, growing forage or grass to balance the production of more nutrient-demanding crops.

Adolph Goettel, head of the soils branch of Alberta Agriculture, adds that the province's soil conservation program provides financial assistance to farmers desiring to counteract erosive forces by planting grass, installing windbreaks, filling gullies and reworking waterways.

Another method of erosion control, still in the testing stages in Alberta, is "zero till," where crops are planted without cultivation of the earth, and weeds are

One environmental limitation on agriculture is rain, particularly in northern Alberta. The arid south has the opposite problem.

LAUREN DALE

controlled chemically. This is "an important step, particularly in Alberta south of the TransCanada Highway where moisture is limited . . . you won't dry out the soil by cultivation."

Also, farmers in the south have for the last 40 years practiced "strip cropping" where crops are planted in narrow strips perpendicular to the direction of the prevailing winds, and "trash cover farming" where straw and stubble are maintained as a protective cover on the land.

But there's at least one agricultural practice accepted by most Alberta farmers that a University of Alberta professor says is responsible for deterioration in the condition of the soil: summerfallowing, or leaving fields plowed and tilled but unseeded.

According to C.F. Bentley, past president of the International Society of Soils Science, summerfallowing--generally thought to control weeds and build up soils--should be replaced by "proper soil management techniques and cropping practices."

As he explains it, when early settlers first broke the soil, they disturbed the humus, or decayed plant matter, that had been accumulating for perhaps 10,000 years. As the native vegetation was removed, the soil became wetter, accelerating the rate of humus decomposition. As it decomposed, it released much nitrogen, causing crops to grow well.

But as the years passed, less and less nitrogen was released and the amount of humus declined. This decline was worsened by summerfallowing, because with no crop to take away the soil's moisture, the decomposition of humus was accelerated.

Furthermore, the lesser amount of humus was incapable of holding water, and so moisture moved downward and horizontally through the soil, "coming out 100 yards or up to 40 miles away."

"When it comes up it has lots of dissolved salts in it," said Bentley, which decrease the yield-producing capability of the soil. And the water may cause soft spots in fields where farm machinery gets stuck. Finally, the nitrogen from the decaying humus not being taken up by a crop may be "leaching down (in the form of nitrates) through the soil and polluting groundwater."

Other water-related environmental problems are sometimes created by the drainage of sloughs in northern Alberta and the irrigation of dryland in the south.

Efficient drainage is necessary to all successful agricultural operations, but it can alter water tables by leaving less water to 'recharge' wells and streams. Drainage can also wipe out valuable protective cover and nesting habitat for waterfowl as well as watering grounds for other species.

According to Alberta Agriculture, about 850,000 acres of southern Alberta are under irrigation. This can cause a problem opposite to that of drainage: water tables are increased, sometimes to the point of waterlogging inadequately drained soil by seepage through irrigation canals.

A handbook by the Alberta Institute of Agrologists says an estimated 90,000 acres of land in Alberta irrigation projects have become waterlogged or salted. "Salts, mainly those of calcium, magnesium and sodium, are inherent in most semi-arid soils but under dryland agriculture they do not present any large scale problems. However, without proper control of salinity and groundwater, the complete breakdown of an irrigation project is possible."

New techniques are emerging for effective canal linings and drainage systems, but they are expensive.

An irrigation study prepared for the Oldman River Basin Study Management Committee says that some saline land can't be drained and may have to be abandoned. "From an environmental point of view it may be desireable not to reclaim some of the very highly saline, unproductive lands in order to minimize salt pollution in streams and rivers."

The agrologists' report suggested that waterlogged land use be changed from agricultural to wildlife. Indeed, this could help compensate for the large amount of wildlife habitat that has been destroyed through agriculture. While waterfowl, beavers, coyotes, bears and wolves have caused losses to farmers, extensive clearing and cultivation--particularly to the edges of water bodies--removes the food and cover that constitute wildlife habitat.

This concern is dealt with further on in the magazine, as is the question of pollution, both that which is caused by agriculture and that which agriculture unfortunately receives. Also discussed are the environmental constraints on agriculture--primarily poor soil, rainfall fluctuations and hail--and attempts at overcoming them.

Competition between subdivision developers and farmers for top-quality agricultural land is probed, and several different styles of farming are examined, including early-day homesteading, a modern hog farm and the 'back to the land' lifestyle, from the perspective of their impact on the land.

Finally, we look at environmental trends in agriculture. The questions of increased productivity and farmers' financial returns, as important as they are, are treated only within a context of environmental quality. As one report states, "the conflicting needs of short-term economics and long-term ecology have to be reconciled," in agriculture as in other resource industries.

The difference, of course, between agriculture and other 'extractive' industries is that, unlike oil and gas or coal, food production from the land is renewable, provided the needs of the land are monitored and met.

With a continually increasing world population and predictions of future food shortages, they can hardly afford to be ignored.

Kathy Kennedy is the freelance editor of this magazine.

Kathy Kennedy

Problem Wildlife and the Farmer

This land belongs to you and who?

Just whose land is this, anyway?

Does it belong to the beaver, whose dams have made a virtual lake out of fields at Gunn, northwest of Edmonton, keeping one farmer from getting the hay off his land for three consecutive years?

Or does it belong to the farmer, like the one 50 kilometres south of Edmonton who displaced hundreds of ducks by draining a lake so he could cultivate the lake bottom?

According to the overworked words of the folk song, the land belongs to you, and me--and, by logical extension, the pintail duck and the white-tailed deer and the sharp-tailed grouse . . . .

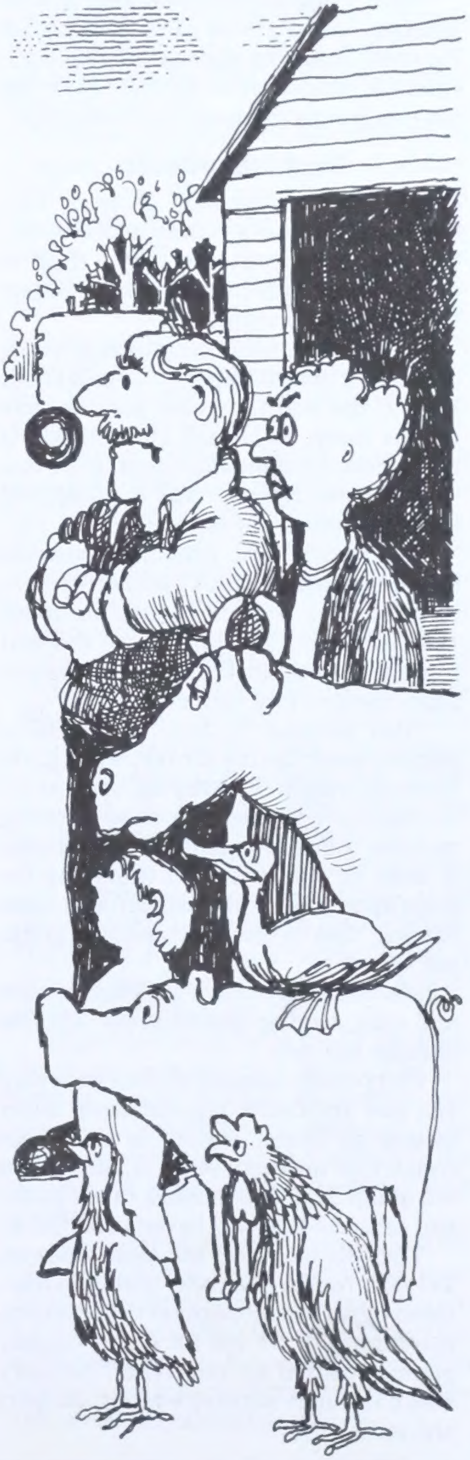
But when it comes to reconciling the conflicting interests of people and wildlife, particularly those of farmers and waterfowl, ground squirrels, beavers, coyotes, bears and wolves, the ditty has still to be written.

And it all depends on how you look at it. The farmer obviously needs to make a living off his land to support his--and our--way of life. The birds and animals need to support their way of life, for example their feeding and nesting habits, to continue living off the land.

The clearing and cultivation of land have resulted in destruction or drastic change to much of Alberta's traditional wildlife habitat. On the other hand, farmers' efforts at efficient and economical food production are often hampered by birds that trample and eat grain, beavers that flood fields, and predators that kill cattle, sheep, swine and chickens.

It's a balancing act between the interests of farmers, represented in government by Alberta Agriculture, and wildlife, represented by Recreation, Parks and Wildlife.

In the past, the different perspectives of the two departments have resulted in certain policies being at odds. But an interdepartmental problem wildlife committee has been given the task of defining a comprehensive policy for prevention and compensation of wildlife damage, and is the vehicle through which coordination is emerging.



LAUREN DALE

What are the most troublesome species from the farmer's point of view? What are the most damaging agricultural practices, from the perspective of wildlife? How can the two groups live more harmoniously?

Problem wildlife

Despite all the publicity given to fur-bearing animals as a menace to livestock, this cost to agriculture is only a drop in the bucket compared to the cost of waterfowl damage to crops.

For example, while the province, under its predator indemnity program, paid about $40,000 last year to farmers and ranchers for the sheep, swine and chickens killed by coyotes, the estimated loss of grain due to waterfowl damage was one hundred times that much--$4 million!

The federal and provincial governments each paid about $1 million in compensation, as well as kicking in about $250,000 apiece for 'lure crops' and bait stations to keep ducks, geese, cranes and other species from farmers' fields.

Most damage is done as the birds migrate south during the fall, when grain crops are lying in fields drying, says Louise Horstman, a biologist working with the problem wildlife committee. More damage is done by the waterfowl trampling the grain upon landing and takeoff, and while feeding, than by the actual eating of grain, she added.

Blackbirds are also a problem in corn and oats, having caused about $23,000 damage last year.

Forty-four thousand dollars were paid last year for cattle, pig and sheep losses caused by bears, mainly in the Peace country of northern Alberta. Bears also did about $100,000 damage in beeyards, and caused additional havoc in oatfields.

The province paid the same amount, $44,000, for the livestock--mainly cattle--killed by wolves throughout the province, and a total of $7,500 for losses--mainly poultry--caused by the 'other' category which includes skunks, weasels, badgers and mink.

But compare these figures to the amount of damage caused by ground squirrels, which cut down fresh grain and reduce forage in pastures. Ground squirrels cause an estimated 'several millions' in losses each year, according to Cliff Barrett, supervisor of animal and pest control in the agriculture department.

Field mice cause some damage in fields and graneries, as do pocket gophers. Rats could cause extensive losses, said Barrett, but an $85,000 rat control program keeps them well under control.

Last year, particularly in the Cypress Hills area of southern Alberta, elk were an unusually great problem, getting into standing crops and haystacks as well as damaging fences and eating grain stored in graneries. They caused a total of about $77,000 damage, but there are currently no government programs to compensate farmers for such losses.

Beavers, which plug up culverts and streams, are a serious nuisance in some places, although there is no estimate of the damage they cause. Deer, moose and rabbits can be pests in tree nurseries.

Blackbirds in a field near Brooks.

Scattered patches of land left in their natural state provide wildlife habitat on a farm in the Cypress Hills of Southwestern Alberta.

HEY! This is MY dinner!
Hey! Get your Fat foot off my Family you big Moo!

Problem farming

According to Doug Culbert, wildlife habitat development biologist with Recreation, Parks and Wildlife, the agricultural activities that most drastically affect wildlife habitats fall under four main headings: clearing, cultivation, grazing and haying. But other activities, like drainage of sloughs, can also affect wildlife.

Clearing is "probably the worst form of habitat destruction," said Culbert. "The key to habitat is food and cover--you take that down and you don't have anything." Loss of habitat is particularly extensive when land is cleared right down to creeks and sloughs, not leaving any patches of wildland.

Clearing can be beneficial to some species, he added. For example, it can open up meadows encroached upon by aspen and poplar, creating more forage for elk. The key is diversity: the more diverse terrain types, the more requirements will be met for more wildlife species.

Cultivation, again particularly to the edge of water bodies, creates the same cover problems for wildlife habitat, although it may benefit some animals like the white-tailed deer which eat alfalfa and some cereal crops.

Ideally, said Culbert, farmers and ranchers should graze cattle at 55 per cent utilization of available forage, leaving 45 per cent 'carryover' to serve wildlife as nesting cover, protective cover for the young, and as a source of food.

However, he added, about 80 per cent utilization takes place today. Grazing livestock trample nesting and protective areas, and cattle compete with deer, elk and moose for forage.

Haying, particularly to the edge of water bodies, can also destroy forage and cover in addition to killing young birds, especially when conducted in early summer.

Most species of wildlife in Alberta have been affected by agriculture, said Culbert. Mule deer and pheasants are among those whose populations have definitely declined as a result of agricultural activities.

What can be done?

Under the province's 'Buck for Wildlife' program, which takes $2 from the cost of each hunting and fishing license purchased in Alberta, wildlife habitats are maintained and improved. In fact, about half of the 33 'Buck for Wildlife' projects now underway are upgrading wildlife habitats affected by farming and ranching on Crown and private land.

There are also a number of things individual farmers can do to reconcile their activities with the needs of wildlife, although some farmers may find some of them impractical.

Patches of accessible land can be left in a natural state, and 'travel lanes' or corridors, about 90 metres wide, can be left so wildlife can go from one area of wildland to another.

While clearing, cultivating and haying, farmers can stay away from water bodies, leaving perhaps a 90-metre buffer zone from sloughs. Haying can be done between July 1 and August 1, when the hatching of birds has been completed.

Selective fencing can be done, with woody areas and shorelines fenced out for wildlife. Grazing can be done at lower densities, and perhaps on a rotational basis, retiring a pasture every year so the grass can recover. Pastures can be fertilized so large volumes of forage are available.

Losses from waterfowl can be lessened by the planting of lure crops and the maintenance of bait stations to provide alternate food sources for birds. Or farmers might be compensated for leaving standing swaths for deer, pheasants, hungarian partridges and overwintering birds.

The farmer shouldn't have to carry the cost of preserving wildlife habitats, agree those involved in wildlife management. Wildlife is a provincial resource; this is why the province pays farmers for livestock killed by predators.

Under the 'Buck for Wildlife' program the government also pays for the construction of fences along streambanks, and sometimes for the cost of maintaining the fences as well. "We are also looking at tax rebates for setting aside woodlots," said Culbert.

The problem wildlife committee is expected to propose an answer to the question of how much responsibility different sectors of the population should take for problems created by wildlife, and also suggest compensation programs in problem areas not currently covered.

Bob Blakey

Two Gopher Tales

In a quest for fairness, Environment Views asked for two perspectives on the wily rodent: One from the frazzled farmer atop his swather--with another broken sickle, the other from the gopher underground.

A rattlesnake lunges at farmer Bill Boychuck's high, rubber boot. Boychuck kicks it away and walks over to his truck, parked near his front door.

Rattlers flourish on Boychuck's farm outside Lethbridge but he doesn't discourage their presence because of his extreme dislike for another of nature's creatures: the gopher.

Gophers once populated Boychuck's farm in ever-swelling numbers, but not now.

"The rattlers keep them down," he notes with a smile. "We don't really see them anymore."

His opinion of gophers is typical among southern Alberta farmers, although few would go as far as Boychuck in letting rattlesnakes roam near their houses. As cute as the gopher appears to some--the Saskatchewan Roughriders, for example, proudly display drawings of their mascot Gainer Gopher--they are the scourge of farmers whose livelihood depends to a large extent on relatively level fields.

Mounds created by their tunnelling tend to get in the way of swather and combine cutters.

"The swather hits them and bends the cutting bar," Boychuck explains. "You're always breaking sickles."

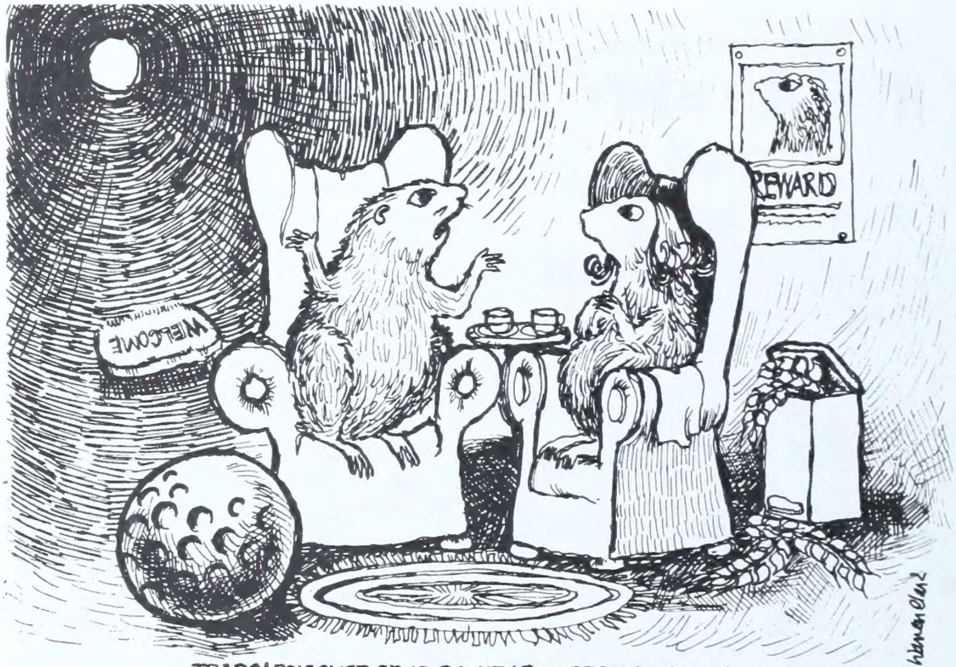
Like any other animal, the gopher has to eat. What's at hand is often a crop that a farmer had other plans for.

George Goldie, another southern Alberta farmer, has seen gophers extensively damage his crop.

"They cleaned out different areas of the field" several years ago, Goldie recalls, leaving about five acres "bare."

There's no financial estimate of damage caused by these rodents, says Alan Norris, a field supervisor for Alberta Agriculture. They are, however, a "definite nuisance."

Norris frequently receives requests from farmers for advice on gopher control. The rodents' population rises and falls in cycles, he has noticed, and at the moment the total is "fairly heavy."



TRAPS! POISONED GRUB, BOUNTY POSTERS EVERYWHERE...
NOW GET A LOAD OF THE **PILL** THEY EXPECT YOU TO SWALLOW!

So what can humans do about controlling the gopher population besides leaving the work to hawks, coyotes, weasels, domestic cats, foxes, skunks, snakes, owls and badgers? Numerous remedies have been tried over the years, from poisonous gases--including car exhaust--to a birth control substance mixed with bait.

The latter experiment caused a Willow Creek councillor to speculate the whole program would fail if gophers should forget to take their pill for a single day.

While sterilization chemicals might appear more humane, old-fashioned poison has proven to be most effective, specifically a stychnine solution on oats or wheat, shoved down the tunnels in early spring while the hungry gopher is still not fussy about what it eats.

The anti-coagulant Rozol has also claimed some gophers, as has a substance called gophacide.

The leg-hold trap is another time-honored device.

Norris would like to see farmers give youngsters a taste of free enterprise by offering a bounty on each gopher they catch. That would be better for kids, he says, than "watching the tube too much."

Norris says he's even tried a machine called a burrow builder, which tunnels through the ground dropping poison bait, but conditions have to be perfect before it will work.

As if he weren't maligned enough, the furry fellow has even performed mischief on the golf links. D'Arcy Kavanagh was playing golf at a Medicine Hat course a couple of years ago when his ball landed on the edge of the rough.

As he approached it, a gopher emerged, nudged the white sphere, then carried it down his hole.

Kavanagh, cursing over the fact it was a brand new ball, contemplated his score card, then refused to count the customary two strokes for a lost ball.

"I called it an act of God."

Bob Blakey is a journalist in Lethbridge.

Dan Stoker

There is a war on in Western Canada! Sure, some would say it should have been over long ago. And on paper, at least, title to the land is clear. The farmers won.

But in the wheat fields and prairie landscapes of central and southern Alberta, a gregarious group of insurgents remains entrenched and as pesky as ever in its claim on the land. No farmer worth his salt can deny the existence of an established underground in Alberta.

Standing small beside its bunker, the 'gopher,' as it is disdainfully referred to, hardly looks a match for its foes. This is especially true when viewed alongside the mechanized invaders rolling by in their latest iron fortresses designed to bring the land into total submission.

The Richardson Ground Squirrel (*Spermophilus richardsonii*) has been a long-time resident in Alberta. In fact, this 30 centimetre excavator and grass cutter was quite well adapted to the prairie landscape long before white, or for that matter, red-skinned hominids sauntered into the scene. Unlike their intruders, the ground squirrel's needs were never great, just a place to dig and some surrounding low-level greenery to supply multi-course meals throughout the warmer seasons. The natural prairie had supplied those needs. Much to the dismay of man, so too do the cultivated fields that have replaced it.

Perhaps a closer look at the ground squirrel's innate features, both physical and behavioral, might shed some light on their success story against man.

Physically speaking, the 'gopher' sounds like a push-over. The identification books describe a plump body, short legs, a stubby tail, short broad ears and small internal cheek pouches. They do have fairly long, slightly curved claws, but they are on tiny paws. And they do have a good set of buck-teeth, but admittedly they are rather small. Thus there seems to be little physical basis for the 'gopher' success story. One has to look at behavior.

The Richardson Ground Squirrel, it is presumed, received an engineering degree in mining and excavation from the school of survival. As a master tunneler, the 'gopher' has latched upon a technique to fend off the elements, man, and a wide variety of potential predators including the weasel, coyote, fox, hawk, eagle, badger and bobcat. Mind you these factors still take their toll, but the underground labyrinth or honeycomb (in French *gaufre* and thus the name 'gopher') turns out to be the ground squirrel's salvation. It offers an ever-present sanctuary, whether it be from the sweltering heat of a blazing sun in summer, the salivating smile of a scrawny coyote in the fall, or the bone-chilling blasts of a blizzard in the winter.

The mini-engineer gauges its tunnels at about eight centimetres in diameter. Excavated material is piled on the surface mainly around a central tunnel. The mound becomes both a sentry post and signal station. Approaching danger, man or beast, is saluted with a shrill whistle and an ever-present jerk of the tail. The deciphered signal presumably means either, "Watch out partner!" for those 'gophers' within ear-shot, or simply, "You'll never get me" for those visitors bringing trouble.

Clamouring down the main entrance, the 'gopher' immediately has a maze of interconnecting passages from which to choose its escape. Tunnels may be from two to 15 metres long, each leading to entrances or escape hatches at the surface. Nearly all will be built between about one and two metres below the surface. With an average of eight entrances to choose from, a foraging ground squirrel has a number of vanishing points.

If 'gophers' only built tunnels, agricultural entrepreneurs might have given up the battle as hopeless. But a ground squirrel has to eat. It also has to provide for five or more new arrivals in late April or early May, the product of early April escapades. So from the moment in March when the 'gopher' normally shakes out the cob-webs of hibernation, its motor-mouth is at work changing plant matter into gopher matter. Like everyone else, a ground squirrel has to make a living.

Grass, numerous prairie plants, insects and even the flesh of less fortunate comrades that dare to cross the enemies' asphalt trails, make up their diet. But so too do freshly-drilled wheat seeds or the succulent stems of growing grain that dare to surface a few weeks after planting in the spring. At harvest time, with a little effort, the standing stalks meet a similar fate and are pulled down to yield the greatest treat of all, and just in time for winter. With over 200 grains of wheat or oats stuffed in each cheek pouch, 'gophers' turn into miniature trucking units hauling away farm profits for storage in the food chamber of the underground maze.

Instincts dictate that in Alberta country, a ground squirrel that doesn't pack away a food chamber full of springtime snacks could face a rude and white awakening in March. Instincts also dictate that if a ground squirrel hasn't prepared a slightly deeper hibernation chamber by late September and sealed itself away for the next five months, an early winter storm could prove deadly serious. Mother Nature can be just as ruthless as a frustrated farmer when it comes to lazy 'gophers.'

So the war continues and farmers and farmers' sons pass on their deadly tricks and games to strangle, poison, drown and gas the ground squirrel. The three-cents-a-tail bounty of the 1800's is hardly necessary anymore when farmers figure a gopher gone is a bushel gained.

But through it all the ground squirrel survives, living by instincts that can't be questioned. And incongruous as it may seem, naturalists believe that the ground squirrel has expanded its range, living quite well, thank you, in some of the new areas opened to agriculture.

Dan Stoker is Alberta Environment's Environmental Education Co-ordinator.

Historical Contrast

Maureen Methuen

From axes and stubborn oxen . . .

PHOTO COURTESY OF THE PROVINCIAL ARCHIVES OF ALBERTA

Early farmers in Alberta, usually immigrants from Europe or the United States, came from a variety of backgrounds and occupations. Few had previous farming experience, but they all had one thing in common: they had put a $10 deposit on a quarter section, and hoped to gain clear title to the land by, among other things, clearing and breaking five acres each year.

Hans and Ellen Beck, who still run a farm near Gwynne, 64 kilometers southeast of Edmonton, remember those days well, for both came from homesteading families.

The land around Gwynne was, as Ellen remembers, "thick with trees, right side by side, so you could hardly walk through them." Clearing was tedious. Brush was cut and burned, then trees were cut with an axe and hauled away for firewood or building. Stumps were dynamited or were pulled from the ground using teams of oxen or horses. Hans tells of his grandfather who broke the land with 'stubborn' oxen.

"They didn't like the heat, those oxen. My grandfather would get up at 3:00 a.m. and plough till 8:00 a.m. Then he'd hook the oxen on a chain and tether them out. And at 4:00 p.m. he'd start again and go till 10:00 at night."

Ploughing land with a team of oxen produced a furrow 45 cm wide. Breaking, planting and harvesting five acres of uncleared land was a full year's work. It made sense to choose the line of least resistance in clearing, so most homesteaders broke up the land with the fewest trees growing on it.

Hans laughs as he recalls: "Some of these guys had so many little fields cleared here and there, they practically forgot where half of them were hidden when it came time to thresh."

Grain was cut with a binder, stooked and put in stacks, which sometimes stood until -35°C waiting a turn at the threshing machine. Generally only one man in the community owned a machine, so threshing was done for an hourly charge when the machine was available. Early stationary threshing machines were operated next to the stacks of wheat. Six men on a bundle rack pitched wheat into the machine where it was threshed into straw and grain. About 13 1/2 kilograms of wheat yielded one half bushel of grain and a mechanism indicated every half bushel of grain processed up to 100 bushels.

Homesteaders around Gwynne were fortunate in having top grade soil. Most had mixed farms, (grains, livestock, poultry) so manure was used for fertilizer. No chemical fertilizers were available. Crops were rotated and summerfallowed so that nutrients in the soil would be renewed.

Irrigation and drainage depended on where a farm was situated. No one set up irrigation systems. As Ellen says, "there were the wet years and there were the dry years." It was a case of accepting what nature chose to bestow. Early frosts and hard winters took their toll, but hail is not remembered as being as "prevalent as it is today;" perhaps this is because less land was under cultivation.

There were no sprays for weeds or controls on rust and other crop diseases. Gophers and crows, because of the crop damage they caused, were considered pests.Gophers were shot, trapped or drowned, often by children who wanted to earn the cent offered for each gopher tail. A penny was also paid by the county for each pair of crow's feet. A prize was offered yearly for killing the most gophers or crows.

Coyotes, which occasionally went after chickens or sheep, were shot by homesteaders who sat up awaiting their nocturnal visitors rather than actively hunting them. Most other animals, including some that might be considered pests today, were looked on as food by the average homesteader, who supplemented domestic meat with deer, partridge, prairie chicken, fish, jackrabbit and ducks.

Flies and bugs were endured by men and livestock alike. Livestock received no shots, but apart from colicky horses, which were let out to roll, Hans doesn't remember a lot of sick animals. He blames some of today's problems on "crazy feeds and fertilizers," but is quick to add that no alternative is available if you plan to run a modern farm at a profit.

The preparation and preservation of food on a homestead was as integral a part

. . . To 160 horsepower, conveyor belts and electrical control panels

of the lifestyle as the tending of livestock and the growing of crops. Some people built icehouses which kept meat cold for a few days in the summer. Meat to be preserved for longer periods was canned in salt brine or cured with saltpetre, a preservative still used today.

"They don't cure meat nowadays," Hans maintains, "they treat it. In those days, if you smoked a piece of meat, you could nail it on the south side of the house and it would keep all summer."

Vegetables and fruit were canned in abundance. Everyone had at least one cow for milk, butter and cheese. Eggs were preserved in waterglass. Grain was brought to a grit mill where it was ground into flour for homemade bread. Even yeast was home grown.

"People would buy . . . raisins, dried prunes, coffee, tea, sugar . . . apart from that, we hardly bought anything," recalls Ellen.

If little was bought, little was thrown away. Quilts and pillows were made from poultry feathers and goose down, and soap was made from animal fat. A coffee substitute was made from roasted barley if coffee was not available. Even tree stumps were valued for they were big enough to keep a fire going overnight. Stumps were cut by a bucksaw into 35 cm square blocks and were burned in the big wood heaters.

What was bought was often paid for by skunks, weasels, coyotes and bush rabbits. These animals were hunted for their pelts which could be sold for ready cash. Every resource which could be used was considered an aid against the challenge of the wilderness.

It was a lifestyle which thoroughly tested an individual's ingenuity and endurance. Nevertheless, to Hans and Ellen Beck, remembering the family evenings spent around the warmth of the heater, it had its own intrinsic rewards. Hans sums it up: "Their grocery bills weren't too high in those days, but they lived good, you bet your life they did."

The modern Alberta farmer likely has at least $300,000 invested in land, livestock and sophisticated equipment, perhaps a degree in animal science or agricultural engineering, a head for business, and access through advanced technology to improved methods of breeding, disease resistant crops and chemical herbicides.

He must take advantage of every aid available to him, for if he faces a vastly different prospect than did early homesteaders, it is a prospect that still requires ingenuity and endurance. The challenge a modern farmer faces is running a farm on a competitive basis. That means using every dollar's worth of feed or fertilizer to maximum efficiency.

Earl, Keith and Ralph Rasmussen, nephews of Hans Beck, run Gwynne Vista Farms, a mixed farming operation which specializes in hogs. Their main crop is barley, half of which is used to feed livestock, the remainder being sold for malt and cereals. Beef cows are also kept, fattened over the winter and sold in the spring.

Modern crops are, of course, subject to the same environmental scourges that plagued early homesteaders' crops, but farmers today have some protection. In the case of frost and hail, crop insurance covers input cost (seeds and fertilizers), but that's it, and losses one year may mean less seed or fertilizer the next. Even small hailstones can wipe out 30 to 40 per cent of a crop and the Rasmussens can remember three out of six years being partly hailed out.

Early August frosts cause a substantial weight loss in a barley crop. Heavy rain, which could really delay the homesteader, is less of a threat to modern farming. Bigger machinery (tractors up to 160 hp) seeds and harvests quickly, enabling

Top: Hans Beck (on combine) and Tom McLelland (on tractor) in 1934.

Bottom: Hans today, on a tractor swathing grain.

MAUREEN METHUEN

farmers to take advantage of good weather while it lasts. Earl can remember seeding 140 to 160 acres a day, and harvesting 40 acres a day. Bucket elevators and bigger bins accommodate more grain for drying and grain dryers eliminate spoilage of wet grain.

As much straw as possible is left on the fields at harvest time to renew nutrients in the top grade black soil. The main recycling practice at Gwynne Vista Farms, though, is the use of waste products for fertilization. Manure is washed from gutters in the barns to a holding tank; then a liquid manure is suctioned out by a tractor-pulled tank which converts to a sprayer. Some farmers have dumped waste into lagoons where it runs off into small creeks, evaporates, or is hauled away yearly, but, as Keith points out, this method of dealing with by-products is inefficient, and most farmers, for sheer economy, recycle as much as possible.

Barley is continuously cropped; side effects are avoided by changing varieties and by rotating hay, oats or wheat. Colleagues from other parts of Alberta, where land has been continuously cropped without rotation, have complained of a rust-like disease affecting crop yield.

Herbicides are used; specific chemical formulae are available for wild oats, hep nettle and a host of other unwelcome weeds. Spraying is a tricky business, though, Earl maintains. Crop 'burning' may be a side effect of spraying weeds when grain is advanced past a certain stage (sometimes a week's delay due to rain eliminates the possibility of spraying) and an overdose will affect crop yield, producing deformed heads.

As for chemical fertilization, Keith is adamant: "If you're going to pay off your farm, you use chemical fertilizers. It costs $20 an acre to put it into crop and harvest it. If you summer fallow, you have to cultivate four or five times. That's going to cost you $12 to $20 per acre, plus the loss you take in not growing a crop. And the following season, that land with no further fertilization will yield only 30 to 40 bushels per acre, instead of 70 to 100."

Modern diesel-powered equipment and the use of electricity have increased the efficiency of the farm today 40 to 50 times over the original homestead, estimates Keith. Electrical equipment is even used to grind, process and regulate feed for the hogs. Conveyor belts, and pipes for diverting feed in mid-stream from one steel granary to another, remind one of a miniature industry. Ground feed, usually barley, is automatically mixed with soybean meal, salt and minerals. Electrical control panels register any shortage and the entire mixing operation shuts off until the supply is replenished.

This automation and precise measurement of feed only hints at the mathematical calculations that go into raising hogs. From conception to market, a hog's life on the Rasmussens' farm is a study in efficiency.

Aid from the government, which the early homesteaders didn't get, consists of artificial insemination programs to provide access to the best genetic strains across Canada, agricultural consultants who will supply information on subjects ranging from building plans to applying specialized herbicides, and a variety of loans.

Pollution, another item that wasn't so readily experienced by homesteaders, is noticeable at Gwynne four or five days a year in the spring and fall, in the form of a temperature inversion. There is "no real effect at the moment," according to Keith, but he wouldn't welcome a gas blowout. A fellow farmer suffered losses--sick pigs and reduced litters--after a blowout near his land.

What is the philosophy of today's farmer who scientifically programs farming operations for the utmost efficiency and calculates costs to the cent? Does he still feel close to the land?

Keith responds: "There is a lot of gratification in working with the land and livestock and the weather--seeing what grows and what will work. You have the feeling of creating something from nothing. And then, sometimes you put in your time and effort to no avail. But that's the sort of gamble a fellow takes."

Maureen Methuen is a freelance writer living in Edmonton.

Sharon Adams

Agriculture and Pollution

LAURENDALE

Alberta is a child of the Green Revolution. Untapped until recently, her agricultural riches now help feed millions around the world. And in an era when famine is no stranger, when each year an estimated 70 million more people are added to the global population, Alberta's contribution to the food pool is important.

Each year the pressure from the produce-starved world increases. The farmer, whose economic survival depends on ever greener fields, is glad of any help in his battle for a more plentiful harvest.

But today the traditional enemies of the farmer--bad luck and the elements, untimely rains, early frosts, hail, hordes of pests, droughts and other natural disasters--are joined by pollution, a potential threat of man's own making.

Without proper control, pollutants can travel in the air to affect crops, disperse in the water to make irrigation more difficult and poison the soil.

The source is man--growing cities, accumulated human, animal and factory waste, the internal combustion engine.

But perhaps the most surprising source of all is the farmer himself.

The natural disasters that have traditionally plagued farmers are joined by a threat of man's own making.

His search for greener pastures has resulted in thousands of tonnes of chemicals being worked into the soil, and the environment generally, each year.

The Environment Conservation Authority, in a 1976 report on the use of pesticides and herbicides in Alberta, called for recognition that reliance on chemicals and the "use of new and more productive species whose survival depends upon the controlled environments provided by fertilizers and biocides, increases the magnitude of disasters mankind can be exposed to . . . ."

The report mentions that there are now more than 6,000 pest control products available, using 600 active ingredients. About 300 new products are developed each year.

Although admitting chemicals are necessary to overcome some agricultural obstacles, the ECA warned that some potent chemicals can combine with other chemicals in the soil to produce substances shown to cause cancer or genetic damage in non-target species. It also said genetic damage caused by these chemicals may be passed on from generation to generation, and that some chemicals have a cumulative effect on one species, like man in the DDT controversy.

But the ECA's greatest concern touched the possible chemical interference in the balance of species. Killing populations of one species affects the parasites of that species, its predators and other interdependent life forms; "leading to species imbalance; secondary effects on other life forms may lead to losses or environmental impairment; man's own health and the integrity of the human species may be put into jeopardy."

The Authority warned farmers of a tendency towards over-reliance on chemical herbicides and pesticides, recommended further study into the effects of the chemicals on the environment, urged that the balance of species be respected in the fight to improve agriculture, and asked for recognition of a natural limit to the amount that can be forced from the land.

LAURENDALE

Aside from the general concern voiced in the ECA report for the quality of life which may be affected by chemical use, farmers do battle a continuing series of problems which threaten their land and the dependent environment.

The realities of economics and climate make Alberta a province of many one-crop fields. To make up for nutrients used up by farming operations or otherwise lacking in the soils, farmers must fertilize.

Dr. Marvin Nyborg, a professor of soil science in the University of Alberta's agriculture faculty, explains that fertilizers are necessary, and can as much as double the yields of cereal crops. For example, barley can go from a yield of 30 to 60 bushels per acre after fertilization.

But fertilization can cause the soil to become more acidic. The resulting degeneration is slow--so slow that farmers may not realize the reason for successively lower yields. Given enough acidification, crops will be very poor.

Fertilizers--ammonia or urea are used most often--convert to nitrates in the soil, generating nitric acid. At the typical rate of application of between 14 and 23 kilograms of nitrogen in fertilizers per year, the soil might dip one pH unit over the course of a decade or two, but Nyborg adds: "Many of the soils are naturally acidic anyway, and a little more acidity is bad."

Alberta soils have a normal pH (acidity rating) of about 7.0, which is a neutral condition. If the pH drops to 6.0, some sensitive crops, like alfalfa and barley, are affected. And at 5.0, almost all crops are affected.

The problem is widespread. Alfalfa can't be grown on about one-fifth of the 25 million cultivated acres in Alberta. Barley won't grow on 10 to 15 per cent of the land, and wheat won't grow on between five and 10 per cent.

But the problem is being fought in three ways, Nyborg explains: nitrification inhibitors may be added to the fertilizer; fertilizer may be laid in rows instead of being mixed in the soil; or ground limestone may be added to neutralize acidification. The latter is the most common method.

The insidious acidification of the soil through fertilization is heightened by industrial pollution, particularly from sulphur dioxide, acid rains and drifting elemental sulphur, from the processing of natural gas. The damage from these sources is counteracted again by liming.

"In my opinion," Nyborg says, "sulphur dioxide causes at least as much acidification of the soil as fertilization."

Of 270,000 metric tons of sulphur dioxide given off by the processing plants, he estimates about half would be dispersed when the fields are covered with snow or when wind would blow it away. Another quarter would be dispersed in natural areas where it poses no damage to crops. But 67.5 metric tonnes--67.5 million kilograms--would affect agricultural lands.

Most of the processing is done between Calgary and Olds, with small plants located in the north and southwest of the province, but fields for hundreds of miles downwind can be affected. Fields within tens of miles have been known to absorb sulphur dioxide at a rate of between 13 to 22 kilograms per acre per season, he says.

An additional 1.2 to 1.8 kilograms per acre per season may be added in small areas by 'acid rains' caused when the suspended gas combines with water to form sulphuric acid during a rainstorm, but usually, Nyborg says, there is enough dust in the air to neutralize the acid. Acid rains are a rarity and not a significant problem.

Windblown elemental sulphur, which can erode from huge stockpiles waiting to be shipped to market, has been a problem in the past, but after several instances of serious damage to land, the industry has instituted careful controls.

Pesticides can also be a farmer's bane, for an insecticide applied to control one pest is bound to kill other insects as well.

Dr. George Evans, a professor of entomology in the U of A's agriculture faculty, says farmers are "hooked" on sprays. And they're stuck, he says, because "once you spray, you have to spray all the time."

Not only is an insect pest destroyed, but so are its parasites and predators as well as other insects Evans describes as "beneficial" to man. Often the target insect develops a tolerance for the pesticide used and can return to attack crops in growing numbers, free from the natural control of its predators.

The beneficial insects destroyed along with the pests are another concern. Honeybees, for instance, are easily killed by some pesticides and their larvae affected by herbicides and other chemicals. When apiaries are depleted, Alberta loses some of a valuable export commodity, and the income of the bees' owner is lessened, if not lost.

Agricultural chemicals are often necessary to maintain and increase yields, but overuse can cause problems.

Aerial spraying of alfalfa near Brooks.

"There's a danger in the pesticide philosophy," Evans says, "but I think times are a'changin'." As the side effects of chemical control of pests are better understood, alternate methods of control gain ground.

Another pollution danger is animal waste.

In large animal operations, swine and cattle mostly, noxious and toxic gases may form from collected animal wastes in large holding tanks.

Another U of A specialist, Prof. Brian McQuitty, is searching for a solution to a problem that is not only bothersome, but can pose a danger to the lives of animals and their human tenders.

"In normal commercial set-ups we get a number of gases involved, some of which are toxic. Others are highly offensive. They can cause deaths among livestock and humans."

He explains that though the problem can be overcome through aeration, mechanical means are expensive, with machinery rapidly corroding and needing replacement parts. Adding chemical treatments may have hazardous side effects on the environment, and is also expensive. Currently he is working on a method of eliminating one of the most offensive and hazardous gases--hydrogen sulphide--by introducing heavy metal, such as ground-up auto bodies, into the stockpile, a method which turns the offensive gas into iron sulphate, not injurious to soils and less hazardous to people.

Most of the manure gathered in this manner is kept to be used as fertilizer. McQuitty says processing the waste into a bio-gas (methane) as a replacement for gasoline is unfeasible now.

But animal wastes, he says, can be a problem where not stockpiled. He says about 500,000 barrels of waste are produced daily from the 40,000 or so livestock operations in the province. A problem can arise where grazing animals concentrate--near feedlots, watering holes, and where they are sometimes wintered on river ice.

There is a code jointly enforced by the departments of environment and agriculture, regulating disposal of animal manures. Some farmers may ignore the provisions, but "only a small proportion may be causing a problem with water pollution."

"Not more than five per cent have even the potential to cause a problem and given the number of producers it wouldn't be feasible to police them all. The educational approach is more reasonable. Farmers are conservation minded. If they know they're creating a problem, they stop it."

Ray Mackowecki, a fisheries biologist with the department of recreation, parks and wildlife, identifies manure, along with erosion, fertilization and use of pesticides, as contributing to a province-wide water pollution problem.

He explains that the basic problem is eutrophication, the enrichment of water that encourages growth of aquatic plants. The plants use up the oxygen, as does the process of decay of the vegetation, and the water quality goes down. When that happens, fish may die and a link in the chain of species is broken.

Cultivation too close to the edge of a stream causes erosion. Sediment silts in spawning areas and streams widen, losing depth and velocity, and encouraging growth of aquatic vegetation with resulting oxygen depletion when plant growth rots.

Through a $550,000 'Buck for Wildlife' program, farmers are being informed of the problem, alternate sites for cattle watering are found, streambanks are fenced off, and fields are moved back from the stream edges.

Dave Graveland, from the agriculture department in Lethbridge, says pollution from human sewage as well as heat pollution are mild concerns in the water-starved south.

"I would say the problem is not very serious here, because most of the affected water is in irrigation canals. The nutrients in the water are beneficial to growing crops. But there are claims made that increased aquatic growth plugs up the sprinkler systems."

So the child of the Green Revolution is coming of age. With sophisticated technology, farmers have been able to raise the productivity of their fields to provide an increasing yield of high-quality food.

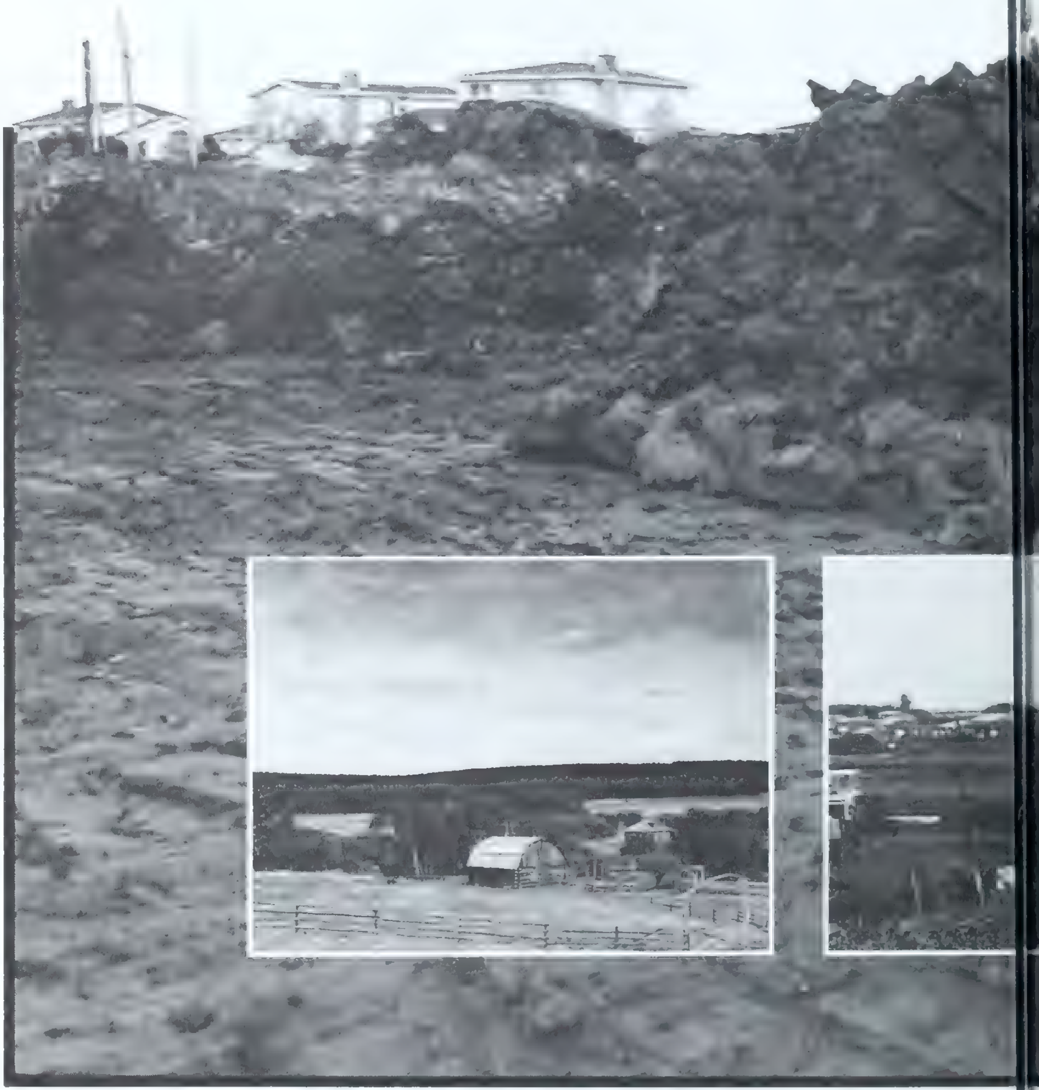
But with maturity comes problems, the ever-present side effects. It will take a sustained, well-funded and coordinated effort by government, science and the agriculture industry to safeguard the environment--that very environment on which continued high food production depends.

Sharon Adams is a journalist in Calgary.

Kathy Kennedy

The Top-Soil Tug of War

The best land for agriculture is also the best land for housing and industry.



It's a classic case of biting the hand that feeds us.

Alberta's fast-growing cities and towns are eating into the heartland of the province, consuming thousands of acres of prime farmland--the land that stocks our cupboards and refrigerators--each year.

Granted the problem hasn't assumed overwhelming proportions in Alberta, considering that about 50 million acres are currently used for crop and livestock production. But only a small proportion of Alberta's land base, about two million acres, is class one soil with no limitations for agricultural production.

If this prime land is used for housing, and farmers are forced to use poorer soils, not only will it take more money to produce a crop but, even with the best available technology, yields will be less.

For example, the class of land (2C) that will grow 39 bushels of wheat or 70 bushels of oats per acre in central Alberta will only grow 24 bushels of wheat or 43 of oats in the Peace River country.

As well, environmental problems will abound in marginal farmlands: how to cultivate steep slopes without eroding them, how to drain wetlands without creating hydrology problems and leaving waterfowl homeless, how to continually use large quantities of fertilizer without polluting groundwater.

So increasingly farmers, planners and local government are expressing concern over the fact that while populations are burgeoning and a worldwide food shortage is predicted, some of Alberta's best and most accessible farmland is being paved over.

Agricultural land is ranked under the Canada Land Inventory on a scale of one to six, from best to worst. While classes two and three have only moderate or 'moderately severe' limitations, class six is only capable of growing forage for grazing.

A report by two soils scientists from the Alberta Institute of Pedology says that between 1966 and 1973, of about 25,000 acres consumed by Edmonton (including Sherwood Park and St. Albert), 41 per cent was class one soil, 25 per cent was class two and 19 per cent class three. Only 15 per cent of development occurred on poor land!

In the same period, urban sprawl in the Calgary area claimed about 15,000 acres. Very little class one soil was lost, "as little occurs in the immediate vicinity of Calgary," but about 71 per cent of the growth occurred on class two and three soils.

According to Environment Canada, from 1966 to 1971 Edmonton was third in the country, after Toronto and Montreal, in its growth onto rural land. Calgary was fourth.

Bill Shaw of the Red Deer Regional Planning Commission says that during the last five or six years about 1,760 acres in the Red Deer city area have undergone the transition from agricultural to urban use. Virtually all of it was considered prime farmland.

There's a *Catch 22* in the situation that makes it easier to understand but harder to resolve. The first homesteaders concentrated in what are now the urban centres because the land was fertile, relatively easy to clear and cultivate, and fairly accessible. Some of the same features of the land---particularly its flat, well-drained nature--encourage developers to apply for subdivi-

sions on it. In short, the land best for agriculture is also best for housing, roads, industries and other uses.

But the value of the land for agriculture can't seem to compete with the market value of the land for development. One farmer 18 kilometres northwest of Edmonton paid $20,000 for a quarter section (160 acres) three years ago, and recently has been offered $250,000 for development.

A Calgarian is considering buying 20 acres of raw land about eight kilometres west of Calgary on a good road. The price: $84,000 or $4,200 an acre. According to an Alberta Agriculture publication, the average value of land sold in that area for farming in 1975 was $457 an acre--the highest average value in the province!

"Until recently, we castigated the developer as the villain, blaming him for rising prices," says Rhys Smith of the Calgary Regional Planning Commission. "But here (in the above example) is a firm illustration that the citizens are doing it to the citizens. Some people are just letting their natural avarice and greed take over."

The problem is compounded, he added, by some farmers' belief that they aren't getting decent prices for wheat now, anyway. "To try to check the growth of cities onto agricultural land is impossible with these attitudes."

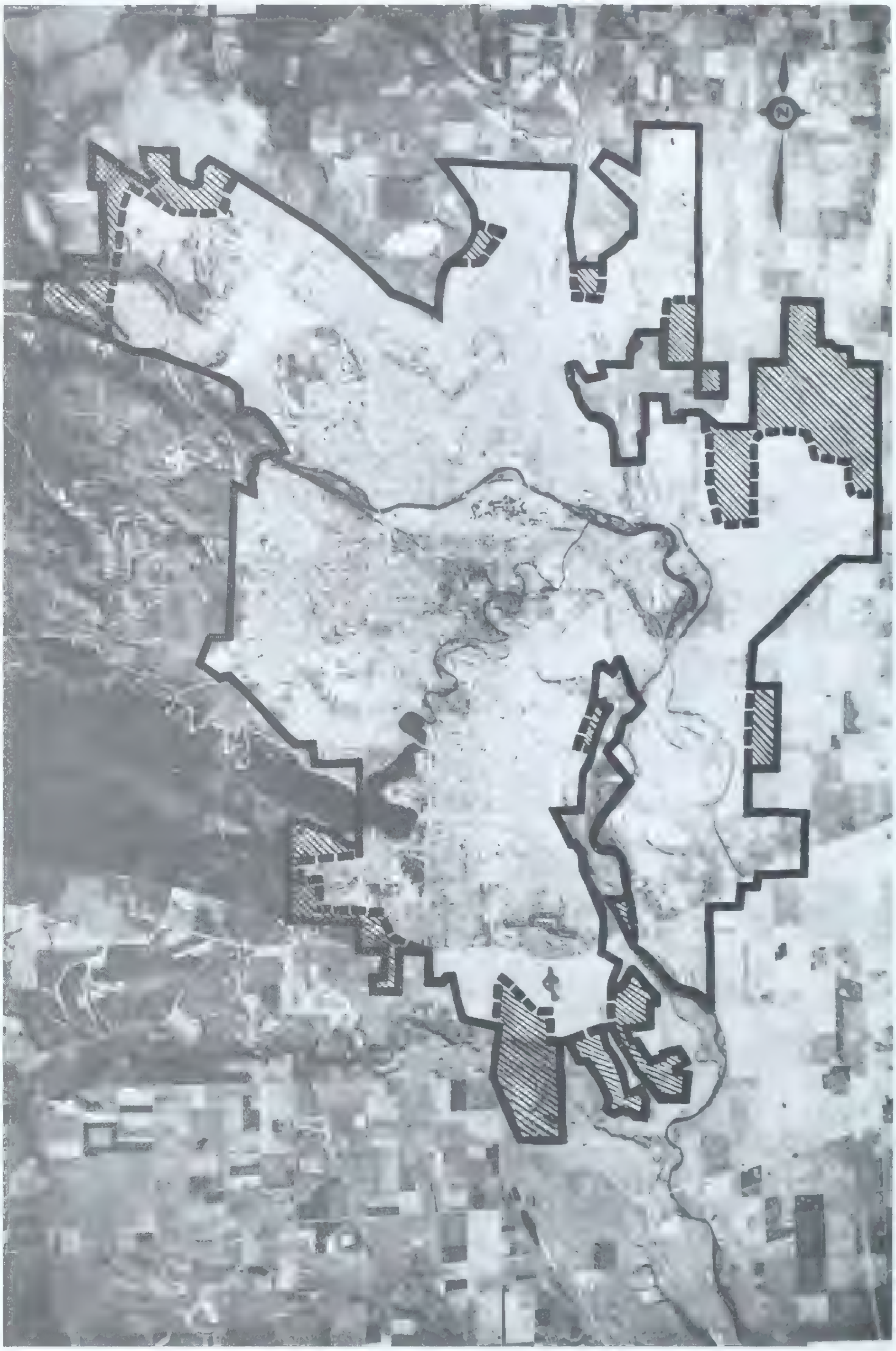
A Unifarm resource economist, Elmer Allen, agrees. "Say a farmer is only getting $20 per acre off his land--then its long-term worth (over 10 years) would be considered $200 an acre. If he could sell and get $1,000 an acre, he could invest that and make $100 a year instead of $20."

But Peter Crown, assistant professor of soil science at the University of Alberta and one of the authors of the Institute of Pedology report, interjects that, considered in the long term, the value of land for agricultural use exceeds its value for development. "The problem is that people compare figures by looking at the market for land, not at the renewable market for

Farmland south of Edmonton falls victim to urban expansion.

Aerial photographs of Calgary (left) and Edmonton (right) show the approximate growth of the cities between 1972 and 1976.

AL RENDALL



ALBERTA REMOTE SENSING CENTRE

the crop coming up on the land.''

It's obviously unrealistic to expect farmers to refuse high prices for their land, particularly if those prices mean a more secure future for themselves and their families. One group of ranchers west of Calgary did band together and buy out land intended for development, just so they could keep the area in ranching. But this entailed taking out hefty mortgages, and farmers can't be expected to shoulder the extra burden.

Most of the attempts to curtail development onto prime farmland in Alberta are being made by regional planning commissions--the rural subdivision-approval bodies--and their member municipalities. The seven commissions don't have jurisdiction over the annexation of land by cities, but they have all become active in redirecting rural development to inferior classes of land.

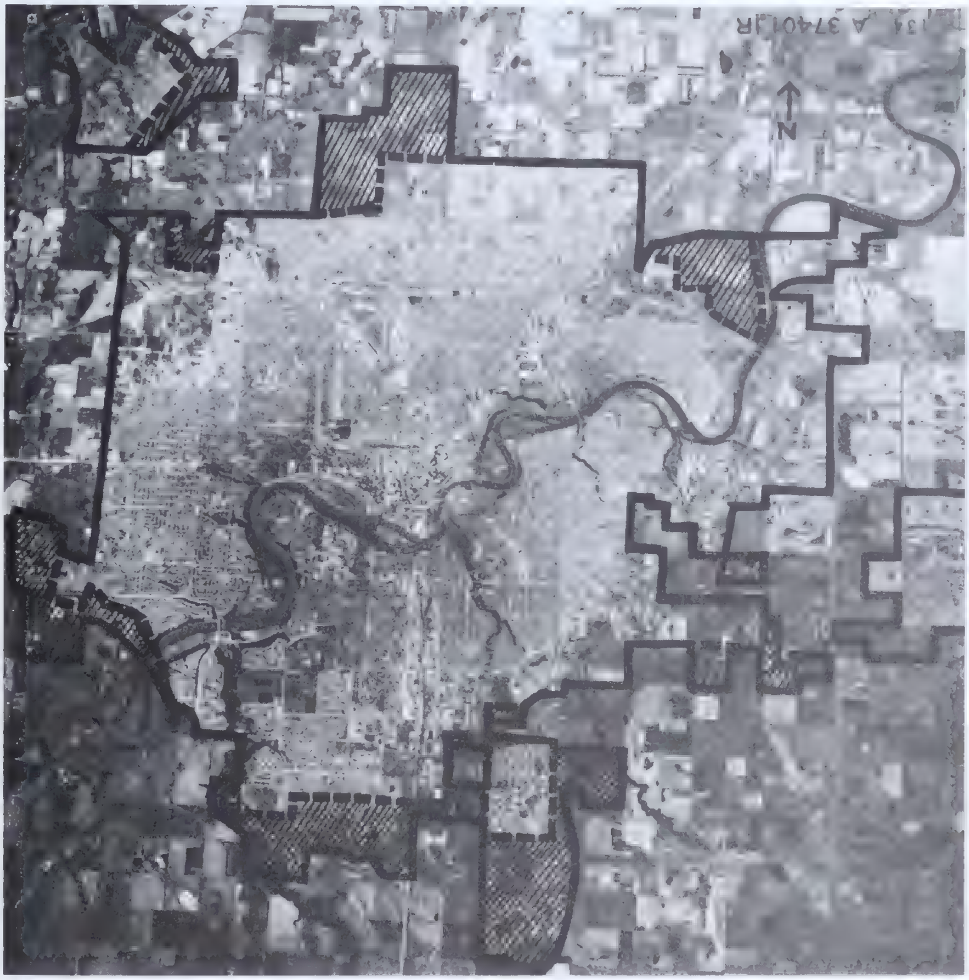
Procedures vary from commission to commission. In the Calgary area, where Smith says local municipalities are becoming increasingly sympathetic to the location of acreages on class four land or worse, a zoning system is used.

Land zoned 'agricultural' can't be divided into parcels smaller than 40 acres, the rationale being that large parcels are more likely to be farmed. If a developer wants to divide a quarter section into 20-acre or eight-acre parcels, the land must be rezoned by local government authorities before a subdivision application can be placed before the planning commission.

In three areas surrounding the city of Calgary--two municipal districts and one county--the land has been zoned 'conservation agricultural' and no automatic subdivisions are allowed, giving the local governments more complete control over development.

Norman Giffin, director of the Edmonton Regional Planning Commission, says that body directs country residential development, or acreages, to classes four,

▨ Shaded areas represent growth



five and six land. On prime agricultural land, only one parcel, of a maximum five acres, is allowed out of a quarter section. That parcel is usually the homestead.

As in the Calgary area, some local districts around Red Deer are implementing strict controls on development. Mountain View Country, for example, has in the past maintained that the minimum parcel size per quarter section is 160 acres--no subdivision is allowed--although it is currently reviewing the policy. Lacombe County, in the last 18 months, "has refused all applications for subdivision," says Shaw of the Red Deer planning commission.

The Oldman River Regional Planning Commission encourages municipalities to zone for a minimum size of 160 acres per parcel as well.

Bob Riddett of the Battle River Planning Commission, between Edmonton and Red Deer, says acreages are not allowed on productive agricultural land there. Every subdivision application is referred to a district agriculturalist who reports back whether the land in question is capable of producing a crop. If it is, the application is being turned down.

"But the poor land is being used up," says Riddett, "and will be gone before long."

Riddett and other commission spokesmen agree that while they can have some effect in rural areas on the consumption of good agricultural land, growth of cities onto the better classes of land is inevitable.

"In Camrose, wherever the town grows it will be on good land. In Ponoka it's the same. One side of Wetaskiwin has bad agricultural land but is prone to flooding and would be uneconomical to service."

Shaw echoes that the only poor land around Red Deer is to the southwest. Not only would Highway 2 have to be crossed, but water, sewer and power lines would have to be extended, and new schools and fire halls constructed. It would be exceedingly expensive, and soon the poorer land would be used up.

The city of Calgary recently considered a number of growth strategies, including one that would have protected good farmland by directing growth to inferior land to the north and northwest of the city, says Ian Fawcett, long-range senior planner for the city. However, "better access and ease of servicing outweighed other factors" and a plan was adopted in principle that included growth to the south and southeast where the land is good for agriculture.

"The massive costs of developing a city are such that if good agricultural land happens to be in the way, development is relatively inevitable," added Rhys Smith. "If you think land costs are high now, they'd be much higher" if the city tried to leapfrog good agricultural land.

A spokesman for Edmonton's long-term planning department said that Edmonton, too, was almost completely surrounded by good land and that the cost of diverting growth to other areas further afield was prohibitive. As a result subdivisions like Mill Woods, on high quality farmland, have been developed.

However, Riddett questions whether high-density urban development on prime farmland is worse than acreages on poor land outside the city. While an acreage may consume 20 times the land of the city lot, agricultural productivity on the acre-

LAURENDALE

age is about one-twentieth that of the lot. "It's not a matter of concern which one you use."

On the other hand, he said, if one looks at food as energy--an acre producing so many BTU a year--and compares the loss of food energy from developing good land in cities with the loss of transportation energy from commuting from outlying communities on poor land, "transportation energy costs far outweigh the savings in agricultural production. The breakeven point is about 1 1/2 miles: absolutely insignificant."

One has to look at the scarcity of oil and gas as well as the scarcity of good agricultural land, said Riddett.

But that's another story. Aside from the planning commissions' work in rural areas, what--if anything--can be done to preserve class one, two and three farmland?

Unifarm, recommending that poor agricultural land be used for urban expansion and industrial sites whenever possible, has suggested establishment of a permanent land-use committee, with representation from farmers and city dwellers, to help coordinate land use throughout the province.

Indeed the Land Use Forum in 1973, suggested setting up a Land Use Secretariat, through which all provincial land use decisions would be channeled. However, a spokesman for Alberta Agriculture says conditions throughout the province vary so much that "it's better to have decisions made locally" by municipalities and planning commissions.

A report by Environment Canada says that where poor agricultural land is available, cities can direct their growth onto these areas, provided proper consideration is given to the current use of the land, for example as wildlife habitat. Unfortunately, most Alberta centres are surrounded by high-quality land and don't have this option.

"For these cities," says the report, "the solution appears to lie in more intensive use of existing urban lands. Higher density dwellings or infilling may be part of the solution. In the long run, it may be to the nation's advantage to direct growth away from these cities into areas where the loss of high quality agricultural or other resource land will not be as great."

Soils Scientist Crown suggested "creative transportation options" to move people from suburbs built on poor land to the city. Such options could include energy-efficient systems like monorails.

The implications of redirecting population growth are enormous, and the first step seems to be public recognition and discussion of the problem.

"There is a fantastic misconception about our land resource," said Crown. "We don't have an unlimited supply of land that can be farmed. But the general public is not well informed and doesn't care that much.

"Maybe if food prices become high enough people will reconsider. But to say 'I told you so' in 25 years won't do any good. We're trying to say 'I told you so' before it happens."

Kathy Kennedy

Back to the Land

"It all comes down
to the first law
of the universe:
Everything is connected."

KEN BURNETT, FARMER

No power. No running water. No indoor plumbing. A 25-year-old tractor. A rusting plow and tiller, overgrown with grass and thistle, that would look at home in an Andrew Wyeth painting.

To most people, it hardly sounds like the good life. To most farmers, it hardly sounds like a good living. But for Ken Burnett, his wife Linda and their two children, it's the only way to go.

"SOME FARM" says the sign as you roll down the driveway on their quarter section near Buck Lake, 110 kilometres southwest of Edmonton, and you get the feeling it's not meant ironically.

A big, imposing man with a quizzical expression, hardened hands and an uncommonly deep voice, Ken Burnett quickly dispels any lingering stereotypes about fuzzy-headed intellectuals heading back to the land, equipped only with vague notions about the abundance of Mother Nature.

"There's no such thing as a free lunch out here," he stresses. "It's satisfying, honest work. I'm doing what I believe is right by me and right by the land. But it takes a lot of gut."

Gut. Like loading and unloading 35 truckloads of sawdust from a nearby lumber mill to break up the clay-filled soil in your garden. Like embarking, almost single-handedly, on construction of an A-frame, solar-heated greenhouse, 30 metres long by seven metres wide, with a peak height of 6 1/2 metres. Like cultivating the earth for wheat, barley and oats on an old tractor, nicknamed 'iron man' for the stamina it takes to ride for hour after hour with no suspension system, no shocks.

His methods probably aren't as efficient as they could be, with more up-to-date machinery, larger scale production and perhaps a hired hand or two.

"One of our basic tenets is to never be in debt," explained Ken, and they're building up their farm gradually, cash on the barrel head. In the three years they've been on the land they've managed to clear about 65 acres, build their house and a geodesic dome to serve as an animal coop, accumulate 140 chickens, a few rabbits, a billy goat, a flock of geese and a cow and her calf, plant a vegetable garden, erect a small, trial solar greenhouse and dig out the foundations for the large model.

KATHY KENNEDY

Although Ken and Linda supplement their farm earnings with substitute teaching--both have university degrees, and he has also been a school principal--and Ken does some work for a neighboring farmer, the land is their primary resource and they treat it as a living thing of inestimable value.

"There's absolutely nothing more valuable than good soil," said Ken. "I've got a philosophy about it. If you put in a little more than you take out every year, it'll treat you right."

He refuses to monocrop, believing that the practice results in the proliferation of insects and bacteria that thrive on that one particular crop.

"I keep a variety of crops and rotate them. Maybe it's not as efficient in the short term, but in the long term I'm treating the land better . . . and dollars ahead because I don't need herbicides and spreaders and so on."

Not that he believes in herbicides and pesticides, either. "I don't believe in putting poisons on the land," he stated in no uncertain terms. "Tillage and good crop management are the way to handle noxious weeds."

Chemical fertilizers?

"Now that's where we separate from organic gardeners," he replied. "We do use chemical fertilizers. If the soil is poor to begin with, you have to put something back."

He applies his philosophy about rotating crops and culturing the soil not only to his fields, but also to his chicken yard. There are actually two chicken yards, and when one becomes chopped up and denuded of greenery he sends the chickens into the other yard and lets the first recover with the help of the chicken droppings that have accumulated over it.

His billy goat "fits well into sound land management," eating thistles and other unsavory roughage.

The rabbits contribute to a cyclical management plan too. Their pen is floored with mesh wire, and droppings, along with spilled feed, fall down into a big rectangular box. Some straw is added to the box and worms are grown there for the garden.

"We used to have a compost pile," said Ken, but now the chickens and dogs eat most of the organic matter that used to go into the pile. The house's wood stove burns much of the rest of the trash, and the Burnetts' four, 200-litre trash cans only accumulate enough garbage to necessitate emptying once a year.

How does a former principal--who has also been a teacher of the Inuit in the Northwest Territories, a diver in Mexico, a community development officer with Indian groups, a welder, a mattress maker and a vacuum cleaner salesman--find himself on the farm?

Three main factors are at play, said Ken.

"First, I have zero faith in the economy. It seems to make sense to be doing things that don't require a wage and where inflation doesn't matter as much.

"As energy gets scarcer, the cost of transporting foods gets higher." The Burnetts are tackling the twin problems of energy supply and expensive food with their solar greenhouse. They have markets for all the vegetables they'll grow--tomatoes, green peppers, and other types particularly expensive in winter--within a 45-kilometre radius, said Ken.

Second, Ken expressed his "difficulty in feeling satisfied doing someone else's work."

"It's really satisfying being your own boss. When I build a fence, that's real. It's satisfying and it's honest. I work 14 to 16 hours a day in the summer and that's all right. There isn't the kind of work that would make me do that anywhere else."

Finally, "it's the space to do what you feel like doing."

"I like to be able to stand naked outside and take a shower (which, incidentally, will also someday be solar heated) and not have 14 neighbors clucking their tongues. My son can make all the noise he wants. My dog doesn't need to be on a chain."

Ken said his uncle was a rancher, but he learned most of his farming by experience.

"I'm in my 30's now. Unless you're blind and dumb you pick up things--a little here, a little there. You learn by doing."

Can he foresee doing this for the rest of his life?

"Sure," he said. And then as an afterthought, with a twinkle in his eyes: "Of course, I've said that before."

KATHY KENNEDY

The Burnetts' house is wood heated, their trial greenhouse solar heated. They keep a cow and her calf, and still use the old tiller.

Jack Spearman

Hitting Back at Hail

Farmers endorse the seeding program but questionmarks remain.

In the decades since land was first broken across central Alberta, farmers have kept a cautious eye on clouds that roll over the prairie and begin to build up as fat, purple thunderheads.

They're afraid of 'bruisers,' intense storms that can produce tons of baseball-sized hail in the time it takes to unload a pickup truck. Ten minutes of fury and a healthy crop, at the height of the growing season, can be reduced to shreds. Farmers can do little more than shrug their shoulders, call the insurance company and talk again about next year.

Hail causes about $50 million worth of damage to crops in this province each year. Unpredictable, it sometimes flattens one farmer's fields and leaves his neighbor's unscathed.

Meteorologists say hail has been recorded virtually everywhere in Alberta at one time or another. But it's a major concern in the so-called 'hail belt' or 'hail alley' between Calgary and Edmonton, an area among the most hail-prone in the world.

Old-timers in Red Deer tell stories of patching holes in roofs after hail fell. They recall brutal storms so large that cattle in open fields were found dead afterwards, looking as if they'd been beaten with clubs.

There have not been any ruinous hail storms so far this year, but 1978 is shaping up as a bad year nevertheless.

"We're over the hump for hail this year, but as of September 1 we had 46 days with hail," says Dick Diebert, assistant manager of the Alberta Hail Project at Penhold. In 1977 the project recorded 43 hail storms; 34 in 1976; 52 in 1975. The average during the past 21 years has been 36, he added.

Peculiar conditions of geography and climate make central Alberta ripe for hail. Clouds climb over the mountains and cool, then become unstable as they meet with hot air masses from the prairies and foothills. Updrafts form, carrying moisture high into the atmosphere.

OK! That's it! Lets get'em boys.

As the updrafts rise, the water expands and ice crystals form, attracting other moisture and staying in the clouds as long as the updrafts can support their weight.

When they become too heavy, the ice crystals fall, gathering more moisture to become hail. Depending on conditions, these ice crystals can form hailstones as small as peas to something the size of baseballs and larger.

The province has spent more than $10 million during the past five years on the Alberta Hail Project, managed by the weather modification board. Housed at the Red Deer Industrial Airport near Penhold, the project has a permanent staff of 25 and seven airplanes to spray silver iodide into thunderheads.

Radar technicians keep an eye on the clouds as they cross the Rockies and the planes are on call around the clock for seeding. Most of the flying is done west of Red Deer, the idea being to get to the clouds before they build up into something dangerous.

There are two ways the pilots impregnate clouds with silver iodide, explained Diebert. The silver iodide--given off in smoke from pyrotechnic flares similar to those used by police at accidents--are dropped either above the cloud to float downward, or beneath to be carried skyward on updrafts.

The chemical competes with natural ice specks for moisture. The theory is that the artificial crystals will cause hail pre-

ALBERTA GOVERNMENT PHOTO LAUREN DALE

maturely and that, as a result, the stones will be either smaller or softer. Sometimes the chemical flares initiate rain.

"We call it the competing embryo theory . . . if we can get to the moisture before Mother Nature gets a chance, then we can change conditions in the cloud," said Diebert.

But after five years of seeding, what have the results been? Farmers in the hail belt, facing escalating damage bills and insurance premiums that sometimes are as high as 16 per cent of the crop value, are solidly behind the program. But the results of the hail suppression program seem to raise as many questions as are answered.

"Some days we do all right and there are others when it's plain you just can't fight nature," Diebert explained.

The hail project divides its territory around Red Deer into northern and southern zones. In the south, hail has dropped by 25 per cent since 1975 but, then again, no 'bruisers' have moved through the area. Major hailstorms can cause half the damage in a growing season, Diebert said. Figures from the north, meanwhile, have been about average.

There are other factors complicating the assessment of results. For example, scientists have learned more about hail dynamics and seeding methods have changed since the project was started.

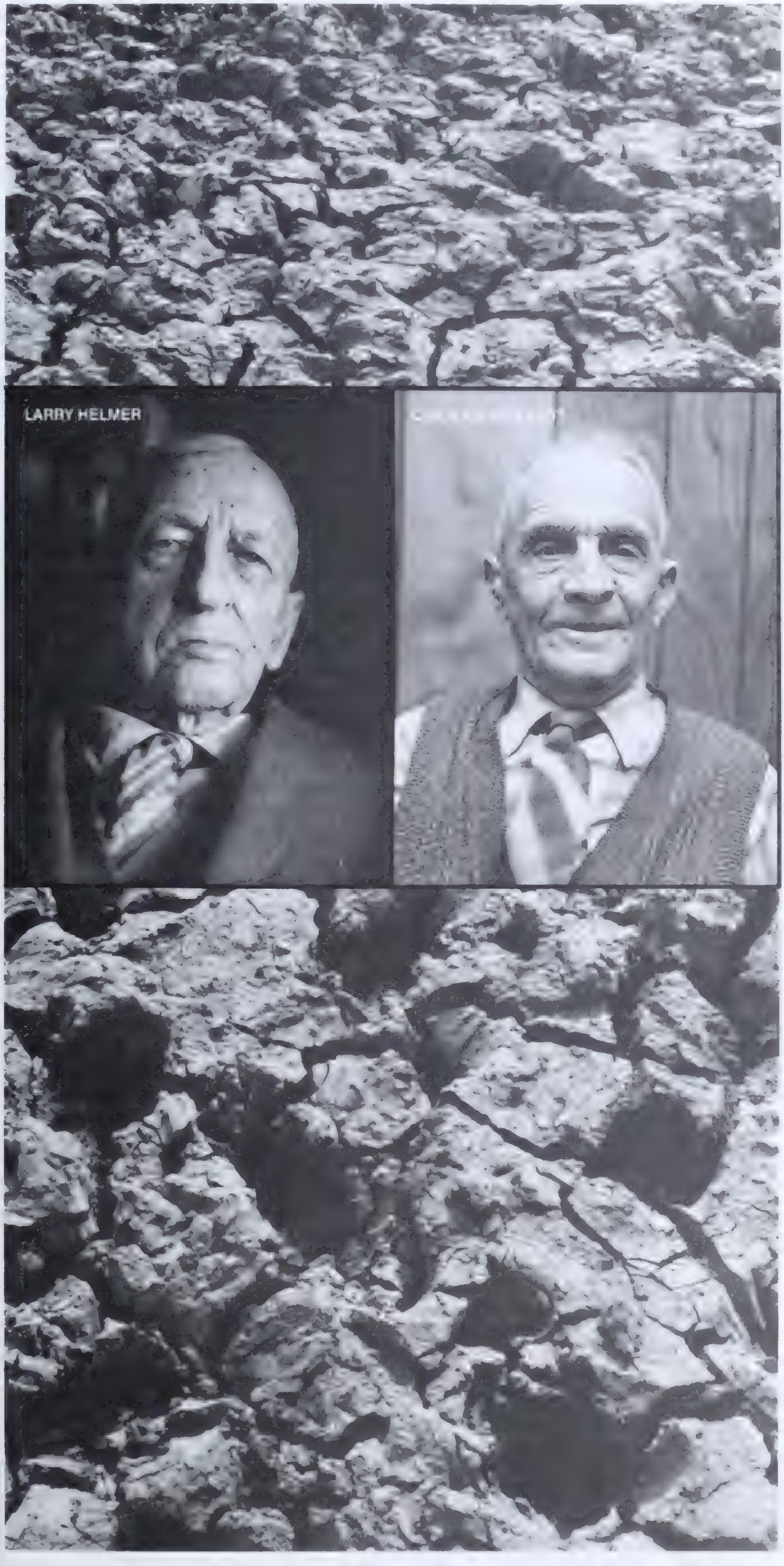
But perhaps the biggest questionmark of all in measuring the program's effectiveness is the simple question if hail would have fallen in the same amount without all the planes, flares and research.

"Has nature shifted things around or are we having an effect? Is the lack of a big storm the result of seeding? I really don't know," said one project official.

Diebert said that as far as he is concerned, the $10 million spent on the project isn't much when compared to hail damage.

Hail, obviously, will continue to fall. But whether Alberta will continue to challenge it will be determined by cabinet, which is bound to ask if the results of the five-year test project measure up to the costs involved.

Jack Spearman is a journalist in Calgary.



LAUREN DALE

Sharon Adams

Surviving The Dirty Thirties

Or: How Water Shapes the Farmer's Fortune

The fog lay thick as a peel on the land east of Drumheller, and the gold and green crops greedily sucked up the late August rain.

But 45 years ago the small streambeds, now gorged with liquid gold, were dry gullies. Then, during the years of the great drought, the crops were pitiful in the desert-like land. Farmers would have sold their souls for a good storm like the one now drenching the landscape, helping 1978's crops to be plentiful.

For during the 1930s in Alberta's part of the Palliser Triangle, a semi-arid vastness stretching south from Canada's prairie provinces to Mexico, the land was blowing in the wind.

And Charles Seefeldt, 93, who farmed for 69 years on the homestead he settled in 1909 in Pollackville, about 180 kilometres due east of Calgary, admits that in those years farmers' tears fell in a drizzle as their luck, with the rain, ran out and lives were wrenched apart.

Now in retirement in Hanna, he is proud of his accomplishment. Proud he was among the first wave of settlers. Proud that he stayed. That he survived.

"It took a lot of nerve for fellows like me to stay there. You had to be pretty hard-headed."

Also hard-hearted, for the drought tore apart his family, separating them for years when his wife and five children were driven to the city where she worked to support them while the children went to school.

But the man remained on the land, his land, through the worst.

The intervening years haven't dulled farmers' bitterness over the mistake bureaucrats made in their over-enthusiasm to settle the west to prevent it from being annexed to the United States.

"Too much of that land should never have been homesteaded. A lot of that stuff wouldn't raise a bean at best. You couldn't put a family on a half section of land and expect 'em to make a living."

The drought only worsened the situa-

LAUREN DALE

tion. When there wasn't enough to go around, something had to give. Thousands left their farms. A census showed that in Alberta alone, 5,000 farms were abandoned in 1936.

"Eighty per cent of 'em had to get out so the rest could survive," Seefeldt said. "In 1935 the Special Areas Board took over in order to keep a few of us down there. The rest they helped to move, mostly up to the Peace River country. There were so many people going, they couldn't pay taxes to keep the schools going. The crops failed and there wasn't anything to feed the stock. So the people left. When things got bad, I saw 11 families move out of the south country in one train. It was an uphill battle for those who moved on. And those who stayed."

Larry Helmer, 90, recently inducted into the agriculture hall of fame for a lifetime of work helping Alberta farmers, was there when the seeds of disaster were sown.

"The land was opened up for homesteading, a half section at a time, in 1909 and by 1912 all the land was gone. I registered 2,700 homesteaders in the best month alone. It was a big mistake to open up all that land for farming."

Helmer recalls the results of a survey taken before the worst ravages of the drought, which showed a family in the semi-arid belt would need at least 3,000 acres of land--five sections, 10 times the amount allotted initially to the homesteaders--to make a living.

So in the 1920s the province undertook to depopulate the land. The government was not as successful as the later drought, however.

Helmer remembered one township that, prior to the drought, had 55 farmers; none live there today. That municipality had a population of 550; today it boasts about a dozen people.

Historian James Gray, in his book *Men Against the Desert*, mentions Alberta's first move against the drought came in the form of a law making it an offense for the dust from one farm to blow onto another. No one was ever charged. Many of the farms had no owners.

Helmer was part of the first Special Area, Berry Creek, formed after the 1932 Special Areas Act was passed. He explained that the special areas boards, under the Municipal Affairs department, were set up to help remove families who were abandoning farms. Also, those who wanted to stay were advised on methods of controlling erosion and providing feed to keep the herds intact.

But, he added, there was only one solution: water. Seefeldt explained how water saved his farm; "When the families spread out and my Mrs. left to go to work, I wouldn't go. After enough of the people pulled out, I got a good supply of water and good land. I made a go of it. The last crop was in 1930. There were seven years when the drought and grasshoppers and rust kept us from getting a crop off, and the rain came back in 1938. In 1939, I planted and harvested my first crop in 10 years."

During those years, his farm grew from the original half section to four sections, still being farmed by his son.

But, as Gray explains in his book, it wasn't only the return of the rain which helped the recovery from the drought. In 1935, the federal government passed the Prairie Farm Rehabilitation Act, which ensured, by helping develop better irrigation methods, cultivation methods, hybrid grains that withstood drought better and studying the effects of erosion, that such a widespread disaster would never occur again.

Although it took a decade for the ravages of the 1930s to end, after the last bad drought in Alberta, in 1961--when yields in a typical census division in the same area were worse than the worst of the Dirty Thirties--good farming techniques ensured a very quick recovery. Five years later farmers in the area were having record yields.

But Conrad Gietz, the agriculture department's agro-meteorologist, agrees with Helmer. Water does shape the farmer's fortune.

"Part of the province has drought in almost any year; crops in the brown soil belt (of southeastern Alberta) would suffer moisture stress almost any year. And in other areas, moisture is a danger. If there is too much fall and spring rain, farmers can't get on their land early enough to plant."

There are two critical times of the year for rain: the fall, when moisture is stored to see crops through the spring; and the summer growing season.

"If you have little rain in the fall, it could get crops off to a slow start. If there isn't enough rain during the growing season, but enough moisture is in the ground from fall rains, crops will have bad yields. And a one, two combination really gets you. Sometimes crop failure."

Nineteen seventy-seven began looking like a terrible drought year, with only 1.17 cm of fall rain, compared to a 5 cm normal in that zone. This was even worse than the '30s dry spells: fall rains in 1934 contributed 6.4 cm and the worst of the years, 1936, saw 3.63 cm fall. Yet good summer rains in 1977 saved the crops.

"All crops in the brown soil zone depend not only on summer precipitation, but if there's no moisture at seeding time, it's risky even to plant a crop in the spring," Geitz said.

But even if the summer rains hadn't come in 1977, he doubted there would have been a repeat of the '30s disaster.

"The conditions now are quite different. I suppose with their limited resources then, the level of management of a typical farmstead was not as high. There was almost no cash available. That meant no irrigation. Conservation was not what it should have been. And the efforts at fighting weeds and things partially contributed to the problem. And they farmed the dickens out of the land, all of which caused erosion."

Jim Neaves

Making do with Gray Wooded Soil . . .

. . . When it's about all you've got

JIM NEAVES

Considering the hazards and problems involved, it is a tribute to northern Alberta farmers like Nick Kucher that they are able to produce crops from the poor gray wooded soil that makes up two-thirds of the province's area.

Nick, 50, has farmed for all his adult life near Athabasca, experimenting with fertilizer and crop rotation systems in an effort to compensate for deficient soil in the area 180 kilometres northwest of Edmonton.

Gray wooded, one of the six major soil types in Alberta, is low in natural fertility. It is generally located in areas characterized by cooler temperatures. High amounts of rainfall--up to 55 cm a year compared with 30 cm in the brown soil around Medicine Hat--are a problem, much of the rain falling at the wrong time. The gray wooded soil suffers poor drainage and, with sunlight at a more oblique angle than further south, is slower to dry. Frost damage is not unusual.

As a result of these and other factors, crops produced on this soil are usually of lower quality, compared with those grown on some other types. And once the gray wooded crops are ready, they are usually some distance from transportation facilities.

But gray wooded soil makes up about 40 per cent of all the cultivated land in Canada, and its use is obviously in the national interest. Alberta has about 50 million acres of gray wooded soil, of which 14 million are considered arable and about five million are actually food-producing.

On the other hand, six of the eight million acres of Alberta's prime, high-producing black soil are under cultivation. This soil covers a heavily-populated corridor running north from the United States boundary through Calgary and Red Deer to Edmonton, then branching east to Lloydminster on the Saskatchewan boundary. Black and four other major soil groups are basically located in the southeast region of the province.

Grass on lands in the southeast has historically provided essential fibre to the soil, but in the northern regions moist conditions have fostered tree rather than grass growth. Leaves and needles decompose rapidly, robbing the gray wooded soil of much-needed humus or organic matter.

Nick and other farmers have added humus by growing grasses and alfalfa which boost the soil's fibre content while helping provide for cattle. Two or three years' seeding to grass or legumes is followed by two or three years of cereal or oilseed crops--such as barley or rapeseed--providing a generally suitable crop rotation.

The University of Alberta's grey wooded soils station at Breton has developed a system of cropping and fertilizing on this type of earth that has "increased yields and the quality of the crop phenomenally," says a project spokesman.

"If farmers use the crops (a legume, ideally alfalfa, is grown with forage and grain) in a livestock system their production may be five to ten times that of their previous practice of just growing grain."

The Kucher family emigrated to Canada in 1929 when Nick was two years old. Lured from the fertile lands of the Ukraine by tales of easy farming on prairie grassland, Nick's father's first choice was southern Alberta, but most of that land had

KATHY KENNEDY

This soil south of Devon has been plowed, then eroded into peaks by rain.

long been taken. It was either Athabasca or the Peace River country.

"It was the start of the Depression and we were so poor I did not wear shoes until I was 12 years old," said Nick. He wore rubber boots over heavy socks during the winters when he had a four-kilometre walk to school.

His father worked hard to clear a quarter section (160 acres), aided by his wife who piled the brush after it had been felled with an axe. "My dad also used to work off the farm to supplement his income, receiving 50 cents a day."

During the blueberry season "my mother would pick 20 pounds (nine kilograms) some days, earning more than my father when she sold them for three cents a pound."

Nick also worked off the farm after leaving school and was able to save enough to buy his own quarter section nearby. He was married to his wife, Jean, in 1956; he asked her whether they should stay on the land or move to the city to work, and she chose the former. They now own five quarters, 800 acres, and lease another 320 acres.

"After I was married 21 years ago I started experimenting myself with fertilizers but it did not turn out so well, that is, until soil testing became available," said Nick.

Proper fertilization has increased his yields by about 10 bushels an acre. This year he cut hay on 35 acres and had 75 acres seeded to rapeseed, 50 in barley, 25 in oats and about 140 acres were left fallow. The rest was pasture for his animals.

But now that Nick has improved his soil through the addition of fibre and the use of fertilizer, he is concerned about the climate, a factor over which the farmer has no control.

"During the last six years there has been too much moisture here--this is my problem, not fertilizer." His fields are low and there is little drainage.

Added to the moisture problem is the short growing period. Gray wooded soils are in an area which has a frost-free period of between 60 and 75 days, compared with up to 110 warm days in other soil regions.

However, each soil type has its problems. For example, prime black soils exist in areas under the relentless pressure of population growth, and more and more prime soil is being lost under concrete (see urban sprawl story).

Solonetzic soils, which have a tough, impermeable subsurface severely restricting water and root penetration below topsoil, are present in all areas of the province. In total, about 12 million acres of Alberta's arable land are affected.

On normal soils, plowing lower than 15 centimetres can be harmful, but research has shown that deep plowing solonetzic soils to a depth of 40 to 60 centimetres and mixing the soil layers can provide benefits lasting up to 13 years.

There are two other primary types of soil problems: salinity and acidity.

Saline soils, which exist mainly in the southern, semi-arid regions, are easily visible by their white, salt-crusted surfaces, while acid soils, which exist in all areas, must be detected by testing.

Acidity can be corrected through applications of lime. Dealing with saline soil is complex, involving drainage through expensive ditching and sometimes pumping off the excess salt-bearing water from below the soil surface.

Much soil research has been done. Technological advances during the last 20 years have provided farmers with the means to increase their efficiency almost twice as much as industry.

Still, much more research is necessary if optimum use is to be made of available soil resources to feed a growing world population. And the gray wooded soils must be among those extensively studied, according to a joint bulletin by the Univeristy of Alberta's agriculture faculty and the research branch of Canada Agriculture.

"The unusual importance of gray wooded soils in this province makes knowledge of their characteristics including advantages and disadvantages . . . as well as recommended management and cropping practices, requisites for their wise and profitable use."

Jim Neaves is a farmer and freelance writer who lives near Athabasca.

D E Griffiths

Agricultural Trends and Environmental Quality

A glimpse of the future

Crystal-ball gazing is a dangerous game, especially in today's milieu of rapid change, but even more so in the world of agriculture and the environment. Farmers produce commodities we all need and for which demand will never cease, yet they live in almost constant uncertainty about their own future.

But what lies ahead? What trends are developing in agriculture that will affect the natural environment and its wildlife? Spokesman for two major Alberta farm organizations, as well as officials in the agriculture department and scientists involved in agricultural research relating to environmental quality, were interviewed to answer these important questions.

Question: What are the trends in pesticide and herbicide use?

Answer: Howard Falkenberg of Unifarm replied: "If all pesticides were cut off it would be chaotic, but pesticides are getting more expensive and farmers don't use more than they have to."

Bill Dascavitch of the National Farmers' Union said: "Inflating costs are making farmers more cautious, but they must maintain production and can't do without (pesticides)."

Generally, researchers agreed that pesticides and herbicides are becoming more specific (affecting only the insects or weeds for which they are intended) and less persistent (their chemical structures breaking down more quickly). Dr. Neil Holmes, acting assistant director of the federal agriculture research laboratory at Lethbridge, says "we've changed the whole spectrum of insecticides, going almost completely away from the long-lived pesticides . . . . " However, he cautioned that some chemicals that degrade more rapidly are also more immediately toxic to the people who spread them, and that farmers must take more care in handling them.

Dr. C.F. Bentley of the University of Alberta, past president of the International Society of Soil Scientists, agrees that the trend is towards chemicals which, "if they don't hit a target organism, attach themselves to the soil and are biologically degraded with no residues of an obnoxious nature." An example is the new herbicide 'Roundup,' which, if it falls on the soil instead of on a target weed, is quickly broken down by soil microorganisms.

Bentley said some agricultural chemicals now used could have adverse effects on people and the environment, although the "probability is not very high." If the public wants increased monitoring of agricultural chemicals and the development of more with the characteristics of 'Roundup,' more financial support must be forthcoming for research or people should be prepared to pay higher prices for food.

Question: How are farmers working to conserve the soil?

Answer: Although farmers seem increasingly aware of the value of rotating crops, and have for some time practiced 'trash cover farming' and 'strip cropping' to prevent erosion (see Introduction), some scientists feel that the practice of summerfallowing, which is on the rise, is resulting in problems for farmland including nutrient depletion and the accumulation of water.

Holmes said that in some areas of southern Alberta, fields are being cropped more frequently to see if the lessening of fallow land will result in less water seeping underground to low-lying farmland.

An Alberta Agriculture spokesman said some farmers in northern Alberta were practising 'winter till,' using a rugged-type cultivator that will leave the surface cloddy and capable of trapping water at spring runoff. Types of machinery are also being developed that will result in less disturbance of the soil surface and hence less erosion.

Question: What trends are evident in fertilizer use?

Answer: Unifarm said "synthetic fertilizer costs rose ten to 20 per cent in 1978, but most farmers don't yet fully appreciate the value of organic fertilizers." Unifarm is planning meetings to help farmers develop better ways of handling and using animal manures.

NFU said: "There has been a marked increase in the use of anhydrous ammonia (rich in nitrogen) because it's quick and convenient to apply. There hasn't been a noticeable increase in organic fertilizer use."

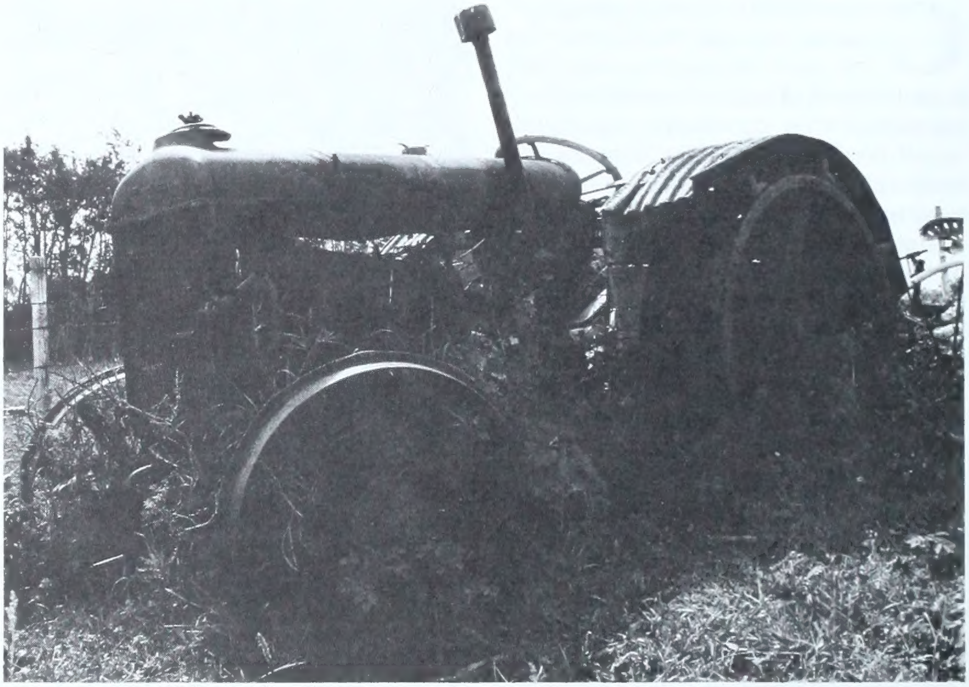
Bentley stressed that all farmers should use farmyard manure, but overuse could result in excessive nitrogen on the land. Farmers should have their soil tested to see what its requirements are.

Alberta Agriculture is working with farmers to encourage proper use of manure as fertilizer and to minimize contamination of air, land and water. The department is also working on new techniques and equipment, such as that for spray irrigation of manure.

Question: Are farmers turning to alternatives to fossil fuel?

Answer: Unifarm said: "We don't see any major changes from oil and natural gas in the near future, but we support the development of alternatives like solar, wind and bio-gas;" NFU's reply was that "costs keep rising, but there is no trend yet to reduce the use of oil and natural gas."

With conventional sources of energy becoming more scarce and increasingly expensive, will farmers turn to time-honored substitutes, like horses and windmills? This cowboy was spotted near Manyberries in the southeastern corner of Alberta; the windmill south of Drumheller.



Both felt prices would have to go up a lot more before there was widespread demand for alternatives.

Alberta Agriculture is involved in three pilot projects: a manure digester to make methane gas, a solar grain dryer (to be economical it needs a complementary livestock operation to use the solar energy when it's not required for the grain) and a wind electricity-generator (still in the very early stages).

Question: Is irrigation expanding the problem of saline soils?

Answer: Unifarm said that "yes, there's more irrigation. Salinity is being closely monitored and corrective action is begun as soon as the problem appears; so far it seems very local, but research is being done all the time."

Bentley said that "salinization is proceeding at least as fast as reclamation procedures." New methods are being devised for sub-surface drainage of irrigated areas, which could help alleviate the salinization problem, but they are costly.

Question: Are farmers willing to keep wildlife habitat on their own land?

Answer: Unifarm replied: "Most farmers have a 'live-and-let-live' attitude as long as they are not losing money to troublesome animals, or feel that they must have the land to increase production--their own economic survival naturally comes first. Waterfowl lure crops and financial compensation have helped a lot, though the money doesn't always cover the entire loss."

NFU's Dascavitch said: "Yes, there's a trend to clear or drain more wildlife habitat, and to cut shelterbelts, but personally I'm opposed to this. Some farmers consider wildlife, like gophers, coyotes, deer and bears as competitors, but again I am for compromise."

There are no legislated restrictions on private farmland, so the owner can graze or clear all his woodlands and drain all his wetlands if he wishes. However, the Alberta government, through its 'Buck for Wildlife' program, has just embarked on a three-year pilot study in Red Deer county to develop incentives to encourage farmers to maintain good wildlife habitat. Wildlife habitat deteriorated by agriculture is also rehabilitated through the 'Buck for Wildlife' program.

Question: Are farmers considering the future potential of commercial game ranching and/or fish control?

Answer: The Unifarm spokesman said "there's very little interest yet. I think a couple of farmers are into commercial pheasant production, and some raise fish in their dugouts, but for home consumption rather than for sale. NFU: "We are not aware of any real interest in these areas yet."

A 1975 paper by Canadian Wildlife Service biologists Ed Telfer and George Scotter, "Potential for Game Ranching in Boreal Aspen Forests of Western Canada," concludes that in these areas the native species--moose, deer and bison--utilize the diverse natural forage more completely than traditional domestic livestock and yield at least as high quality meat.

Question: What is the trend towards developing crops that will withstand environmental constraints such as cold climate and moisture variations?

Answer: Scientists at the research station in Lethbridge have developed a cold-hardy winter wheat that has, in five years, "more than doubled the area wheat can be grown in," said Holmes. Crops are continually being bred to resist drought and escape fall rains and freeze-up.

The provincial government in 1978 set up the Agricultural Research Council of Alberta, whose $10-million, five-year program, "Farming for the Future," is geared largely at overcoming the limitations of Alberta's climate.

Question: Will the family farm survive?

Answer: "The total number of family farms is declining," said the Unifarm spokesman, "but those left are getting larger, and young people are establishing on farms of their own; it's still a going concern and we hope it will remain so."

NFU was less optimistic. "Every year for at least the past eight there have been

LAUREN DALE

fewer family farms. Unless farmers group together into an effective bargaining unit, the decline will continue."

Large-scale corporate farming can have a greater effect on the environment when larger-scale practices result in less wildland left for wildlife habitat. Also more draining and irrigating may take place.

In summary, quite a lot of the environmental devastation that was part of the agricultural settlement of Alberta's prairies, and later the result of too liberal use of persistent chemicals, has been corrected. Certainly several native animals and plants no longer survive on farmlands, but a gratifying number have continued to live in the remaining tracts of natural habitat, and some have even increased, occasionally to nuisance proportions.

So what's the problem now? Basically, it seems to be an economic one. Like everyone else the farmer has to cope with high inflation. To raise his income he must ask more for his produce and also try to increase his yields. Yet every time supermarket prices go up, millions of urban consumers howl in protest (so do the farmers if part of that increase doesn't reach them). Farmers with 'spare' land are beginning to feel they must bring it into 'active production' if at all possible.

Should this become a general trend, hundreds of square miles of essential wildlife habitat could disappear in a very short time. Clearing and cultivating marginal land--land that is wet, or vulnerable to erosion--brings with it additional environmental problems of preserving soil stability and an adequate water balance.

Now that 80 per cent of the population lives in towns and cities, farmers can't be expected to bear the full cost of environmental protection and keeping wildlife habitat intact. Everyone will have to chip in and pay for it--through higher taxes, private donations and, yes, higher food prices.

D.E. Griffiths is a freelance writer living near Edmonton.

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Environment Update

Decision Reserved

The Energy Resources Conservation Board has completed hearings and reserved judgment on the proposed 750-megawatt Genesee power project 50 kilometres west of Edmonton. It must decide whether the Edmonton Power project, or Alberta Power's proposed Sheerness plant in southern Alberta, should be developed first, and also when the alternate project should be built. Included in the questions to be considered is the reclamation capability of the soil and possible emissions from the plants.

Park To Change?

Changes in the use of Willmore Wilderness Park, north of Jasper National Park on the east slopes of the Rockies, could come as a result of a consultants' report commissioned by the provincial department of business development and tourism.

The report, due in March, will look at possibilities for helping the economy of the Grande Cache area by developments such as roads, ski resorts and alpine villages. However, Business Development Minister Bob Dowling says the study doesn't mean anything will necessarily happen in the park, now restricted to non-motorized access.

Solar Zoning Proposed

A Dalhousie law student preparing a publication on legal, institutional and economic impediments to solar energy use in Edmonton, says solar zoning appears to be the answer to the solar rights problem. James Prentice says such zoning--in addition to existing types of community zoning--would restrict the height of buildings in an area and consider the path of the sun so that all property owners would have access to the sun all year 'round.

Waste Heat Recycled

A Toronto couple is building a $200,000 fish hatchery and rearing station near Calgary Power's Sundance plant that will use waste heat from the plant on Lake Wabamun, west of Edmonton.

Warm water from the power company's 1,200-acre cooling pond will be piped through a series of fish rearing tanks. Dave and Jan Bilowus will sell the trout fingerlings to Alberta's 1,000 private fish farmers.

Emissions Questioned

An air quality study done for the Alberta Oil Sands Research Project by Alberta Environment says Great Canadian Oil Sands (GCOS) has a consistently worse record than four of Alberta's largest gas processing plants in exceeding sulphur dioxide ground level concentration standards. The GCOS plant includes a power plant that burns sulphur-rich coke, as well as a gas scrubbing unit, both of which release SO2.

GCOS officials countered that their plant was 'complying fully' with air quality terms and conditions laid down by Alberta Environment, and the company had just completed spending $7.1 million on a unit to help reduce emissions.

Tires Pave Streets

The province, in conjunction with the city of Edmonton, has begun a two-year experiment in paving streets with rubberized asphalt, one quarter of which is simply crumbled old tires. Two test sections of roadway in Edmonton have been resurfaced with the material, which has also been used on Highway 21 east of Edmonton, Highway 16 west of Vegreville and Highway 21 west of Camrose.

Although it's still too soon to pass judgment on the recycled material, a project official says it seems to be standing up well to heavy traffic and gives a softer ride than conventional surfaces.

Plan Released

A 25-year, $323-million program for developing water resources in the Oldman River Basin has been recommended by the Oldman River Basin Study Management Committee.

The committee, composed of five local citizens and three civil servants, recommended construction of four off-stream reservoirs, at Mud Lake, Keho Lake, Forty-Mile Coulee and Sauder, followed by construction, between 1990 and 1995, of a dam at either the Brocket or Three Rivers site.

The Environment Council of Alberta will hold hearings later this fall in southern Alberta on the question of water management in the basin.

Lake Louise Discussed

A discussion paper by Parks Canada consultants suggests restricting residences at Lake Louise to those who work there, and limiting the use of private cars between the lower townsite and the lake itself. The consultants, who are to come up with a final plan for a Lake Louise visitors' centre by the end of the year, proposed that present facilities at the lakeside, in the valley floor and next to the Lake Louise ski resort, remain where they are. Winterization of hotels and motels now used only in the summer would be encouraged.

Public meetings have been held in Lake Louise, Edmonton and Calgary to discuss the proposals.